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## A CASE OF PRIMARY EPIBULBAR SARCOMA, WITH SECONDARY GROWTHS IN LIMBUS AND SCLERA, AND INVASION OF THE CHOROID, CILIARY BODY, AND IRIS.

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(*With four figures on Text-plate II.*)

THE following case is reported on account of certain anatomical features of unusual interest, and as an illustration of the malignancy of epibulbar sarcoma. It may also serve as a caution against the too ready acceptance of the view that epibulbar sarcomata are not of a highly malignant nature,—a view that of late seems to be gaining ground. The case entered the Massachusetts Charitable Eye and Ear Infirmary February 26, 1902, on the service of Dr. O. F. Wadsworth, to whose courtesy the writers are indebted for the opportunity of reporting the clinical history.

The clinical features of the case were as follows:

Peter Emond, forty years old, railroad employé. Family history negative, and general health good up to the time of admission. Two years ago he first noticed a small red spot the size of a pin-head above the cornea, which was visible only on raising the upper lid. One year ago he presented himself at the hospital, showing above the cornea a small round bluish elevation, supposed at that time to be a staphyloma of the sclera. One year later the patient again appeared at the hospital, this time

showing in addition to the original elevation a somewhat similar elevation situated at the nasal side of the cornea and also a large black tumor growing from the limbus. The latter was attached over a relatively small area of sclera and cornea, and formed a tongue-like projection, which protruded through the palpebral orifice and overlapped the lower lid. The condition presented at this time is very well shown in one of the illustrations. The pupil was slightly irregular and did not react to light. The lens was nearly completely cataractous, and the tension normal or slightly raised. At entrance the patient said that he had been troubled for about six months past with pain in the abdomen. An examination showed nodular masses in the hepatic region, and the diagnosis was made of probable metastatic sarcoma of various abdominal organs, presumably of retro-peritoneal glands and liver. Enucleation was advised and performed on March 3, 1902. The orbit healed without incident, but the abdominal pains increased. The patient was afterwards lost sight of and the final result has not been ascertained.

*Pathological condition.*—A small portion of the upper nodule was fixed in Zenker's fluid. The globe, with the other nodules attached, was hardened forty-eight hours in formalin, frozen, and sectioned in a horizontal plane, passing a little above the disc. Diameters of globe: antero-posterior 23.5 *mm;* horizontal, 24.5 *mm;* vertical, 22 *mm.*

*Macroscopic examination.*—Attached to the cornea and sclera there is a tumor mass made up of three nodules united at their bases. The largest measures 12 *mm* vert., 9 *mm* hor., 6 *mm* ant.-post., and is attached by a small base mainly to the cornea, upon which it has encroached for a distance of 5 *mm.* Its surface is brownish black and shows numerous large gray patches and many vessels. On section it is dirty brown and slightly mottled. It does not appear solid but presents a finely cancellous structure. Notwithstanding the fact that it has grown for the greatest distance upon the cornea, it has its firmest hold at the limbus and sclera. Behind the limbus for a distance of 1 *mm* the sclera still shows, but from this point for a distance of 5 *mm* it apparently has been entirely replaced by the new growth, which here presents itself externally as one of the three nodules already noted and forms a dark-blue globular elevation 6 *mm* in diameter, closely resembling in appearance a ciliary staphyloma. Continuing on from this nodule the tumor has invaded the

interior of the globe, growing as a thin black layer on the nasal wall, reaching from the root of the iris to the optic disc, and replacing the ciliary body and choroid. In its anterior portion it has for a distance of 1 *cm* a thickness of 1.5 *mm*, but it then rather abruptly becomes thinner and also lighter in color. Near the disc it becomes thicker again. It has extended downward almost to the inferior pole, and it reaches the superior pole above. It is noteworthy that the tumor of the limbus and the intraocular growth present the same cancellous appearance on section.

The remaining nodule is situated in the ciliary region above and is in continuity with both of the other nodules. It is 9 *mm* in greatest diameter and its surface is 4 *mm* above the sclera. It is not directly continuous with the intraocular growth and seems to involve only the superficial layers of the sclera. Its surface is blue in color and like the other scleral nodule it resembles a staphyloma. On section it appears solid, thereby differing markedly from the other portions of the growth.

The cornea (12 *mm* × .66 *mm*) is perfectly clear except near the advancing margin of the tumor where there is a whitish opacity, somewhat elevated above the surface. At the equator on the temporal side the globe shows a slight staphylomatous bulging and the sclera is here as thin as tissue paper. The anterior chamber is 2 *mm* deep and free from coagulum. The pupillary margin is adherent to the lens on the nasal side, but the iris is otherwise apparently normal. The lens, 9 *mm* × 2.5 *mm*, is light yellow in color, somewhat opaque, and is cut with difficulty. The ciliary body on the temporal side seems normal, but on the nasal side it has been replaced by the new growth. The vitreous humor is faintly cloudy, slightly coagulated, and shrunken away from the retina posteriorly. Beginning at a point corresponding to the ora serrata, the retina is separated from the tumor as far back as the disc, the separation reaching the superior and inferior poles. Behind the separated retina there is a transparent, finely honeycombed coagulum. The retina is also separated in the form of a rounded elevation in the macular region. The optic nerve is translucent and homogeneous, and shows a cup .75 *mm* deep with overhanging edges.

*Microscopic examination.*—Celloidin sections were made of various portions of the tumor and globe and stained in hematoxylin and eosin, Van Gieson's stain, Mallory's phosphotungstic acid

hematoxylin, Weigert's elastic-tissue stain, and Ribbert's connective-tissue stain.

The upper nodule of the new growth shows the usual structure of a small spindle-cell melanotic sarcoma. The pigment is light yellow in color and consists of irregular granules which are practically always contained within the tumor cells. It is not abundant but has a fairly uniform distribution. The tumor cells are solidly packed together and the little stroma present in the nodule evidently belongs to the tumor itself. The nodule is covered by a capsule of connective tissue infiltrated with lymphoid, plasma, and tumor cells.

The tumor of the limbus and the intraocular growth are alike in their structure, but are entirely different from the nodule just described. Instead of being solidly packed together, the tumor cells line the walls of dilated spaces. The latter vary greatly in size in different portions of the growth, but in any one portion they are all about the same in size. The smallest spaces are found at the base of the tumor of the limbus and in the intraocular portion of the growth, and are usually perfectly round and closely resemble the fat spaces of adipose tissue. The largest spaces are seen in the centre of the tumor of the limbus, where they are very irregular in shape and communicate with one another through breaks in their walls. When the spaces are small it is easy to make out that they represent dilated spaces in the tissue, for the connective tissue in their walls is readily recognized. In case of the larger spaces, however, it is no longer possible to make out the connective-tissue stroma even in sections stained by Van Gieson's or Ribbert's methods. The walls of the smallest spaces are often lined by a single layer of tumor cells, but the walls of the largest spaces consist of a number of cell layers. In some instances a space is entirely filled up by the cells. Pigment is more abundant in the tumors of the choroid and the limbus than in the upper scleral nodule, but it has a less uniform distribution. There is no pigment present that gives the reaction for iron. The tumor of the limbus has no definite capsule of connective tissue but is covered by several layers of epithelium.

The inner nodule of the growth really represents a bulging of the sclera where the latter has been markedly infiltrated with tumor cells. Microscopically this is the most highly pigmented portion of the tumor, all of the cells being densely packed with pigment granules. The cells here do not line dilated spaces but

almost completely fill clefts between the fibres of the sclera. The infiltration of the sclera is directly continuous with that of the choroid and ciliary body.

The cells of the tumor of the limbus, and those of the intraocular portion of the growth, are in general spindle-shaped as in the upper nodule, but their nuclei are much richer in chromatin than are the cells of the latter. Here and there small groups of cells occur which are so densely pigmented that the character of the individual cells can be made out only in bleached specimens, and which are quite different from the other tumor cells. They are larger, almost spherical in shape, and their cytoplasm shows a distinct reticulum suggestive of that seen in the fat cells of xanthomata. Their nuclei are very small, poorly supplied with chromatin, and sometimes vesicular and perfectly round but more often so greatly distorted that they seem necrotic. All of the cells infiltrating the sclera are of this type, but no such cells are to be found in the upper nodule. Karyokinetic figures are not very numerous.

The growth as a whole is amply but not highly vascularized and shows no areas of necrosis and no hemorrhagic extravasations. The perivascular lymph spaces in their peripheral portions are widely dilated. There is no infiltration of the tumor itself with inflammatory cells.

Except near the tumor, the cornea shows nothing abnormal, and nowhere is it infiltrated with tumor cells. The tumor is not directly connected with the corneal stroma, but is separated from it by the corneal epithelium and by the epithelium covering the tumor. The two epithelial layers are fused together, but imperfectly, small spaces being visible between them. Beneath the tumor the corneal stroma is considerably infiltrated with pus cells. Bowman's membrane is for the most part intact, but in a few places beneath the tumor it has been replaced by connective tissue. Blood-vessels have grown in from the limbus beneath the membrane, but there are no vessels between it and the epithelium and none in the deeper layers of the cornea. On the nasal side the subconjunctival tissue of the limbus has been completely filled up with tumor cells; on the other side it shows an insignificant infiltration with lymphoid cells.

The iris is slightly œdematous and shows an increased number of fixed cells and some infiltration with lymphoid cells. The posterior epithelium is lifted up in the form of vesicles in many

places. On the nasal side the root of the iris blocks the filtration angle and is completely infiltrated with tumor cells. On this side the spaces of Fontana and the canal of Schlemm cannot be made out. The free anterior surface of the iris has been invaded by a direct extension of the growth, and shows several layers of pigmented tumor cells which reach the filtration angle on the other side and there infiltrate the spaces of Fontana. Here the filtration angle is only partially blocked by the root of the iris. The layers of tumor cells are not uniform in thickness over the surface of the iris, but here and there the cells are collected into small nodules.

The ciliary body on the nasal side has been completely infiltrated and disorganized by the tumor, and the ciliary processes have almost entirely disappeared. The surface of the ciliary body on this side is lined by an irregularly laminated hyaline membrane containing few cells, which posteriorly is continuous with the retina. On the temporal side the ciliary body and processes are atrophic, and the latter are more or less adherent to one another, forming the walls of cystic spaces. The choroid, except where it has been infiltrated by the tumor, shows nothing noteworthy.

The separated portion of the retina is œdematous, and shows perivascular collections of lymphoid and plasma cells and degeneration of the outer nuclear layer. At the ora serrata on the nasal side, the retina is infiltrated with pigmented tumor cells. The optic nerve is completely atrophied, overgrown with connective tissue, and highly œdematous. It shows no sarcomatous invasion.

*Pathological diagnosis.*—Primary episcleral melanotic spindle-cell sarcoma. Secondary growths in sclera and limbus, and invasion of the choroid, ciliary body, and iris.

From the clinical picture alone this case naturally enough was taken to be one of primary melanotic sarcoma of the limbus, the scleral nodules being regarded either as staphylomata or as secondary growths. An involvement of the interior of the eye was suspected on account of the complete loss of vision. Macroscopic examination of the enucleated eye bore out this clinical view of the case, but the microscopic examination, while confirming the extraocular origin of the growth, showed a different relationship between the epibulbar nodules. The solid structure of the upper nodule was in such marked contrast to the structure displayed by the rest of the growth, the latter showing an infiltrating

character throughout, that there could be no doubt that this upper nodule, not the tumor of the limbus, was the primary growth. This was in confirmation of the patient's statement, obtained later, that the upper nodule was the first to make its appearance. That the intraocular portion of the tumor did not represent the starting-point for the growth is clear from two facts: first, that it was not continuous with the upper nodule, the one first noticed by the patient, but with the tumor of the limbus; and second, that it had the same infiltrating character as the tumor of the limbus, consisting of œdematous tissue infiltrated with tumor cells. Macroscopically, too, it had the flattened-out appearance so characteristic of secondary growths within the eye. The sequence of events, therefore, was evidently as follows: There developed in the episcleral tissue just above the limbus, a solid spindle-cell sarcoma of the usual type, which after a time took on an exuberant growth towards the limbus. The tissue of the latter became more and more œdematous, and its dilated spaces became lined by, and in some places filled with, tumor cells. The infiltration then continued at the base of the tumor of the limbus thus formed, and extended into the sclera, finally penetrating the latter and invading the choroid, ciliary body, and iris. While in all probability metastases occurred in the internal organs, in the absence of a general autopsy this cannot be regarded as perfectly certain. It is interesting that the intraocular portion of the growth, except for its pigmentation, histologically presented an appearance almost identical with that of a metastatic carcinoma recently described by one of the writers.* It is also interesting that the growth did not penetrate the globe directly at the limbus, but at a short distance behind it, thus substantiating the usual view that the limbus is peculiarly resistent to invasion by malignant growths.

Epibulbar sarcomata have been the subject of considerable discussion during the past thirty years, numerous cases being reported before 1873 by Althoff, Berthold,[66] Hirschberg,[67]

* Pathological report on Dr. Jack's case of metastatic carcinoma of the choroid. F. H. Verhoeff, *Trans. American Ophthalmological Soc.*, 1902.

and others; while more recently Adamück,[1] Silex,[48] Lagrange,[33] Sgrosso,[46] Strouse,[50] and Panas [32] have reported cases and added to the discussion. There is general agreement as to the main characteristics of these tumors, but there is considerable difference of opinion as to their malignancy and as to the advisability of radical or conservative treatment. Unfortunately the end results have been but seldom noted, so that accurate data as to recurrences and permanent cures are wanting. A most interesting feature of these tumors is their slight tendency to penetrate the globe, a fact that lends special interest to the present case, only four other such cases being reported. Strouse,[50] writing in 1897, and drawing his deductions from twenty-five cases, concluded that they never invaded the interior of the eye; while Panas,[32] recognizing that epibulbar tumors may penetrate inwards, cites only a case of epithelioma. Besides the present case, the writers, as above stated, have been able to find only four epibulbar sarcomata that involved the interior of a normal eye, though three others are known that penetrated an already shrunken globe.*

Regarding the frequency of epibulbar sarcoma, Holmes,[17] in 1878, found 3 cases of sarcoma of the conjunctiva among 20,000 eye cases. Adamück[1] among 16,000 cases found 16 sarcomata involving the eye, of which 3 were epibulbar. Among 44,719 carefully recorded eye cases (1900–1901) at the Massachusetts Charitable Eye and Ear Infirmary,[55] there have been but 2 epibulbar sarcomata including the present case. It is interesting to add that in the same series of cases there were 10 sarcomata of the choroid and 6 epibulbar epitheliomata, all of the latter occurring at the limbus. Epibulbar sarcomata then appear to be, as Hirschberg first remarked, among the rarest of ocular tumors.

The literature contains reference to over 80 cases of purely epibulbar sarcoma situated at or near the limbus, not counting tumors at the fold of transition of the conjunctiva or on the palpebral conjunctiva. Of these the details of 73 were accessible to the writers. Of the 4 cases

* Kirschbaumer[19]: Cases 14, 15, and 16.

that penetrated the globe the first was reported by Kolaczek,[30] in 1880. The case was that of a man aged fifty-six with history of trauma which left a red spot on the conjunctiva that became the seat of tumor formation. This was abscised, but recurred finally as a tumor as large as a plum, involved the anterior segment of the eye and upper and lower lid, and was associated with enlarged preauricular gland. On enucleation four years after the original injury, the interior of the eye was found completely invaded by the neoplasm. In 1881, Adamück[1] reported the case of a man aged thirty-five, who had noticed for several months an apparent enlargement of the globe which on enucleation was found to be due to a diffuse flattened epibulbar tumor on the sclera extending from the cornea backwards to the optic nerve. At the equator, tumor elements were found to have penetrated between the layers of the sclera, and at other places there was complete penetration of the sclera and infiltration of the ciliary body,— the relatively limited extent of the intrabulbar portion leaving no doubt, according to Adamück, of its extrabulbar origin. There had been symptoms of glaucoma, thought to be due to pressure on the venæ vorticosæ. Von Michel[37] reports in 1899 the case of a man aged sixty-three, with a tumor about 6 *mm* in thickness extending on the sclera from the equator forward onto the upper third of the cornea. From the history it was supposed to have started in the episcleral tissue over the ciliary region. After enucleation the iris and choroid were found infiltrated with sarcoma cells throughout their whole extent. The perivascular canals of the ciliary body were also infiltrated, and von Michel concludes that it was by these canals that the neoplasm reached the interior of the globe. The fourth case, reported by Kirschbaumer,[19] was as follows: Tumor on cornea and sclera with a base 22 *mm* in diameter. Sarcoma cells under Bowman's membrane and in the upper layers of cornea and sclera. Ciliary body and root of iris involved, and tumor elements in the canal of Schlemm and in the lumen of the vessels. A possible fifth case, reported by Groenouw[50] was probably not of epibulbar origin, and microscopic sections showed the choroid infiltrated over a much

more extensive area than that occupied by the epibulbar growth. There was also atrophy of the iris, ciliary body, retina, and nerve; and for these reasons, together with the clinical history, Groenouw concludes that the case was of intraocular origin. Deutschmann [60] reported another case becoming epibulbar but probably starting in the ciliary body.

As to the mode by which epibulbar tumors are supposed to penetrate the eye, von Michel,[37] as above stated, thought that in his case it was by extension along the perivascular canals of the ciliary body. Groenouw [59] thinks there should be actual continuity by a connecting strand, and thinks extension by the lymphatics or ciliary arteries unlikely. In intraocular tumors, on the other hand, there may be epibulbar nodules even without visible perforation. In Adamück's case, as already noted, the tumor elements were seen to have perforated the sclera; and in the present case also it was plain that the interior of the eye was invaded by a direct extension.

It was early recognized that epibulbar sarcomata arise in the conjunctiva and in the great majority of cases at or very near the limbus, and Panas,[32] in his recent article, points out that the majority of all cases occur on exposed portions of the conjunctiva—*i. e.*, in the palpebral opening. They have been variously observed as black, brown, pink, or reddish tumors, sometimes forming smooth rounded elevations, and sometimes irregular nodular masses, often friable and bleeding freely; rather firmly attached at the limbus but movable with the conjunctiva on the sclera. The base of the tumor, even when the latter has reached large proportions, is almost always quite small, and Bloch reports one case with a pedicle 1½ *cm* long attached at the limbus. On the other hand, the tumor may exceptionally take the form of a diffuse flat swelling on the globe, and cover the entire cornea, and one case is reported that was connected with the cornea alone.* As a rule, the tumor is readily separated from the cornea proper, and it is generally agreed that the corneal stroma is seldom invaded. It is true that

* Rumschewitsch.[37]

there is occasionally a slight loss of the superficial layers of the cornea, and Sgrosso [46] reports a case where the entire cornea with the exception of the membrane of Descemet was replaced by sarcoma tissue, but here the entire anterior segment of the eye, together with the orbital and palpebral conjunctiva, was involved, and the cornea may have atrophied, possibly from pressure. In the case reported by Wadsworth and Verhoeff,[53] the cornea was indeed infiltrated to one third of its depth by tumor cells, but in most cases the cornea shows a remarkable resistance, as does also the sclera in a nearly equal degree.

Without operative interference these tumors tend to increase steadily without pain, though with variable rapidity. The largest observed was that of a woman reported by Adamück.[1] His excellent illustration shows a tumor as large as a flattened orange protruding from the eye, which at operation was found to be connected with the globe alone, and entirely extraocular. The clinical history of the reported cases shows that the patients have noticed tumors beginning as small spots and reaching ordinarily in a year or thereabouts the size of a pea or bean. Sgrosso,[46] Green and Ewing,[14] and Lagrange [29] report cases where the patient had noticed a small spot for thirty, twenty-five, and fifteen years respectively, which finally underwent sudden growth and extension.

The majority of epibulbar sarcomata are found in people of advanced age, but Krautner,[21] Benson,[5] and Schultze [49] report cases respectively eight, eleven, and fourteen years of age. The average in the appended list of seventy-three cases is fifty-one years. Szulislawski [51] thought they occurred almost without exception in old people. As to pigmentation, twelve in the appended list of seventy-three cases were leucosarcomata; twenty-two contained small amounts of pigment; and thirty-nine were distinctly melanotic. Krautner [21] thought leucosarcomata especially rare. Actually it seems impossible to draw any sharp distinction as regards pigmentation, for recurrences from non-pigmented tumors have been melanotic; and melanotic tumors have recurred as leucosarcomata (Weinbaum).[54] In regard to

etiology, Strouse [50] cites traumatism, pre-existing pterygium, or irritation. Pfingst [38] observed particularly a traumatic case where after a blow on the eye there was a small red spot at the corneal margin which did not disappear but after a few months began to grow and in three years became a melanotic sarcoma. In the appended list of cases, six have history of trauma.

As to malignancy, Strouse [50] concludes that epibulbar sarcomata never penetrate the globe and that they practically never produce metastases. Schultze [42] is struck by their persistent tendency to recur and their slight inclination to invade the globe or produce metastases, and thinks epibulbar sarcomata not so malignant as epitheliomata in the corresponding location. Panas [39] draws no sharp line between sarcoma and epithelioma, and argues at length for and against the sarcomatous or epitheliomatous nature of certain epibulbar tumors. He believes that the malignant tumors are more often multiple and do not arise directly at the limbus but at some distance from it, being what he would call "peribulbar," and to illustrate his point cites the two cases of Seiderer.[44] He thinks that these are the purely sarcomatous cases, and that the strictly epibulbar tumors situated directly at the limbus have a mixed epitheliomatous and sarcomatous nature and are not malignant.* Silex [45] notes that recurrences are common, that they tend to develop in the same locality, chiefly at the anterior part of the eye, and to grow slowly without penetration. Hence in his opinion their relative benignancy.

The writers do not believe in the reality of this relative benignancy, basing their opinion on the results of seventy-three published cases as set forth in the appended list. Of these cases, nineteen were treated by primary enucleation and fifty-three by primary abscission (in many cases later followed by enucleation), and one case was first seen at autopsy. The results were as follows:

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* Only Panas and some other French observers have dwelt upon the supposed mixed nature of these tumors. In twelve epitheliomata and seven sarcomata examined histologically by one of the writers (Verhoeff), the distinction between the two classes of tumors was in every case perfectly clear.

| | | |
|---|---|---|
| *Total primary abscissions* | | 53 |
| No recurrence: | | |
| after six months' observation | 1 | |
| after one year's " " | 4 | |
| after two years' " " | 1 | |
| after several years'* " " | 2 | 8 |
| Recurrences occurred: | | |
| within one year | 10 | |
| within two years | 3 | |
| within several years† | 4 | |
| exact time not stated | 19 | 36 |
| Not followed after operation | | 9 |
| | | 53 |

Among the above thirty-six cases in which recurrences were observed, the following bad results were noted:

1.—Story and Graves[49]: recurrence with preauricular gland. Death in four years from general metastases.

2.—Weinbaum[44] (*a*): within three years enucleation, general metastases and death.

3.—Seiderer[41] (*b*): recurrence with preauricular gland in two and one-half years. Exenteration of orbit and death from supposed metastases.

4.—Kolaczek[30]: preauricular gland and invasion of interior of eye.

5.—Ole Bull and Gade[30]: recurrence in orbit and parotid region.

6.—Matthewson[36]: metastatic tumors on cheek and later on body generally.

7.—Mittendorf[38]: after several abscissions preauricular gland.

8.—Van Münster[39] (*a*): finally enucleation followed by recurrence in lids and orbit.

9—Schultze[42] (*b*): recurrence in lids and orbit. Enucleation and exenteration.

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* Joerss[18]: observed for 4 yrs. Weinbaum[44] (*b*): observed for 10 yrs. after second abscission.

† Estlander[11]: in 4 yrs. Lawford[34]: in 6 yrs. Panas[28] (*a*): in 10 yrs. Blanquinque[6]: in 6 yrs. after several abscissions.

10.—Szulislawski [51]: recurrence in lid from implantation.

11.—Von Michel [27] (*a*): enucleation and recurrence.

12.—Silex [45] (*a*): recurrence in lids and doubtful tumor in abdomen.

Of the remaining abscission cases that recurred, seven are mentioned as having recurrences but the final result is not stated, four remained several years before recurring (see footnote on p. 109), nine were enucleated without further observation, and four were enucleated and remained for a certain time at least without recurrence; and it should of course be noted that among the above recurrence cases and enucleation cases that were not further followed as well as among the primary abscission cases in which there is no note of any recurrence at all, there must have been a certain proportion of serious results. It appears, therefore, that among all the abscission cases the only reported positively good results were in the six cases mentioned in the footnotes on p. 109 and in the above four enucleation cases.*

As regards the malignancy of the cases treated by primary enucleation (nineteen in number), the following facts are noted:

Adamück [1] (*b*): interior of the eye involved.

v. Michel [27] (*b*): interior of the eye involved.

Adamück [1] (*c*): preauricular gland at time of operation.

Sgrosso [48] (*a*): lids involved at time of operation.

Seiderer [44] (*a*): in two years after enucleation recurrence in lids and orbit. Exenteration and no recurrence after four years.

Wadsworth and Verhoeff [52]: secondary tumor on lid from implantation.

Kirschbaumer [19] (*a*): enucleation and death in two and a half years from general metastases.

Wiegand [55]: recurrence in lid and submaxillary region.

Of the remaining eleven primary enucleation cases, one

* Lagrange [32] (*a*): after abscission and enucleation no recurrence after ten years.

Kirschbaumer [19] (*b*): after repeated abscissions exenteration of orbit and no recurrence after five years.

Van Münster [29] (*b*); after abscission and enucleation no recurrence after one and one half years.

Barrenechia [3]: after abscission and enucleation no recurrence after one year.

(Lagrange, *b*) had no recurrence after ten years, and in the remainder the after history is not given; from which it cannot be inferred, however, that there were no recurrences, as such cases might often reach the hands of the general practitioner rather than the oculist.

The one case (Addario [3]) first seen at autopsy showed metastases throughout the internal organs.

In view of the above, the writers feel that epibulbar sarcomata must be considered highly malignant, judging by their tendency to recur and produce general metastases. That the immediate results are not always serious and suggest a relative benignancy, may be explained by the facts that these tumors are at first isolated on the conjunctiva resting on sclera and cornea, both highly resistent to invasion; and that they are observed very early, for an epibulbar tumor is noticed and treated much sooner than a small nodule elsewhere. Histologically they do not differ from other sarcomata, and the writers believe them to be essentially no less malignant. That a few may be cured by abscission alone, can be explained by their small size and isolated situation at the time of operation. These cases, however, are few, and it will be observed that in the forty-four cases of abscission that were followed (where operation was performed in most cases before the tumor had exceeded the size of a pea) recurrences were known to have occurred in thirty-six—*i. e.*, in 81.8 % (and in all probability in many of the others which were not observed), and in the total number of cases, omitting only the nine abscission and the ten enucleation cases not followed after operation (fifty-four), metastases occurred either before or after operation in twelve (22 %), six of which were general (11 %). That the results after enucleation would be more favorable is natural on account of the more radical nature of the operation; and that there were some general metastases even after enucleation certainly strengthens the argument in favor of the malignant nature of epibulbar sarcomata.*

* As an unusual manifestation of malignancy, the case of Szulislawski [81] and that of Wadsworth and Verhoeff [82] may be mentioned in which there was a secondary growth on the lid, produced by implantation.

The trend of opinion among most observers is in favor of simple removal at first with more and more radical treatment as recurrences occur. Silex [45] thinks the choice of operation should depend upon the intelligence of the patient and his ability to report for observation; and he favors enucleation where there is any chance that the patient may neglect medical treatment or in any case if vision is lost (and it may be noted that it is almost always impaired from irregular astigmatism). While recognizing the malignancy of these tumors on general surgical and pathological principles, Silex deplores the too ready enucleation of eyes regardless of sight and the extent of the neoplasm. Lagrange [22] is of the same opinion, remarking that although these tumors are of the same structure as the most malignant melanotic tumors, they are remarkable for their benign behavior, and he thinks a radical operation should only be done when they threaten to spread over the entire globe.

In opposition to the above, the writers believe that simple abscissions are decidedly dangerous, and that in view of the safety of the patient enucleation is always to be preferred. A large number of all abscission cases finally come to enucleation after a more or less protracted period of ineffectual treatment, and thus at a most unfavorable time.

## CONCLUSIONS.

(1) Epibulbar sarcoma differs from general sarcoma in malignancy only in so far as it is isolated on the highly resistent cornea and sclera, and comes to operation relatively small.

(2) While highly malignant it seldom penetrates the interior of the eye.

(3) After abscission recurrence, sooner or later, almost invariably occurs and general metastases are not infrequent.

(4) A microscopic examination having made the diagnosis certain, immediate enucleation should be advised in all cases, but the final choice of operation must lie with the patient, to whom the highly unfavorable prognosis has been made clear.

(1) ADAMÜCK. (*a*) Man, forty. For many years small blackish spot on conjunctiva. Rapid increase within a few months to size of a walnut, extending from cornea to equator. Excision. No recurrence after one year. Spindle cells with some pigment.

(*b*) Man, thirty-five. Flattened tumor on sclera from cornea to optic nerve noticed by patient for only a few months. Enucleation. Interior of eye involved. Some pigment. No note as to recurrence.

(*c*) Woman, fifty-five. Tumor as large as an orange resting on globe and extending from cornea to optic nerve. Several years' duration. Preauricular gland. Enucleation. Melanotic sarcoma. No note as to recurrence.

(2) ADDARIO. Man, eighty-five. Tumor at anterior segment of eye 37 by 25 *mm.* Duration two and a half years. Case first seen at autopsy. Throughout internal organs "small black spots and nodules" were found. Tumor consisted of spindle cells. Melanotic.

(3) BARRENECHIA. Man, fifty-two. For two years small tumor at limbus the size of a pea. Abscission. Recurrence in one year, and second abscission. Again recurred as tumor extending from cornea to optic nerve. Enucleation and no recurrence after one year. Large-cell sarcoma.

(4) BAUMGARTEN. At first small black spot near the limbus. In three years the entire half of the bulbar conjunctiva covered with black nodules. Enucleation. Large, round, and spindle cells.

(5) BENSON. Child, eleven. Small tumor at limbus the size of a pea for five years. Abscission. "Sarcomatous-looking cells" with pigment. No recurrence after one year.

(6) BLANQUINQUE. Woman, sixty. Small spot near cornea for twenty years. Size of a pea when operated. Abscission several times. Again recurrence after interval of six years. Melanosarcoma.

(7) BLOCH. Woman, fifty-one. Pediculated tumor at limbus. Rapid growth within three months. Abscission. Large-cell leucosarcoma. No recurrence mentioned.

(8) BOCK. Man, sixty-two. Tumor as large as a pea at limbus, of one year's duration. No operation till one year later, when tumor had increased and filled space between the lids. Enucleation. Large-cell Sarcoma. Melanotic. No recurrence mentioned.

(9) DEGERING. Woman, seventy-seven. Flattened fungoid

tumor at limbus large enough to prevent closure of lids. Duration four years. Enucleation. Result not noted. Large round cells. Melanotic.

(10) DONALDSON. Woman, twenty-one. Tumor at limbus as large as a bean, of nine months' duration. Abscission. No recurrence after one month. Leucosarcoma. Round cells.

(11) ESTLANDER. Woman, thirty-three. Tumor at limbus following injury. In seven years the size of a pea. Pigmentation of conjunctiva about the cornea. Abscission and in four years multiple recurrences. Small round cells.

(12) FANO. Old man. Pigment spots on conjunctiva bulbi et tarsi. After five years two tumors as large as beans in upper-inner quadrant of conjunctiva bulbi. Abscission and recurrence in one year. Large cells with pigment.

(13) GIULINI. Man, fifty-two. For many years a small spot on bulbar conjunctiva, which within one year began to grow, covering front of the globe. Abscission. Melanosarcoma. No note as to recurrence.

(14) GREEN and EWING. Man fifty-seven. Began twenty-five years ago as spot at the limbus. When operated was as large as a bean and on both cornea and sclera. Enucleation. Spindle cells. No pigment. No note as to recurrence.

(15) GROSSMANN. Woman, thirty. Small tumor on conjunctiva, near insertion of sup. rectus. Abscission. Spindle cells without pigment. No note as to recurrence.

(16) HEDDÄUS. Man, fifty-four. Tumor at limbus as large as a cherry. Color brownish black. Duration three years. Abscission. No recurrence after two years.

(17) HOLMES. Woman, forty. A small spot on the limbus for many years, which within two years had increased in size. Twice removed and recurred. Finally enucleation. Round-cell sarcoma. Melanotic. Later history not stated.

(18) JOERSS. Man, sixty-two. Tumor 2 by 1 *cm* from edge of cornea to outer canthus. One year's duration. Abscission. Small-cell leucosarcoma. No recurrence after four years.

(19) KIRSCHBAUMER. (*a*) Woman, fifty-eight. Tumor starting from small spot near limbus, and extending from cornea to equator. Enucleation and death in two and one half years from general metastases. Melanotic.

(*b*) Woman, thirty-eight. Tumor near limbus as large as a pea, starting from small brown spot. After repeated abscissions tumor

returned, extending from the limbus backward into the orbit. Exenteration, and no recurrence after five years.

(20) KOLACZEK. Man, fifty-six. Redness at inner part of conjunctiva after injury, followed by tumor formation at same spot. Abscission and recurrence. Tumor finally as large as a plum involving both lids and anterior segment of eye. Preauricular gland. Enucleation. Invasion of interior of eye. Melanotic angiosarcoma.

(21) KRAUTNER. Child, eight. Small tumor above the cornea near limbus. Abscission. Small spindle-cells, without pigment. No recurrence mentioned.

(22) LAGRANGE. (*a*) Woman, seventy-five. Small tumor at limbus for fifteen years. Sudden growth within three years. Abscission. Several recurrences and tumor finally as large as a cherry. Enucleation and no recurrence after ten years. Spindle-cell melanosarcoma.

(*b*) Woman, forty-two. Tumor at limbus as large as a small egg. Of two years' duration. Enucleation and no recurrence after ten years.

(23) DE LAPERSONNE et CURTIS. Man, sixty. Tumor of a few months' duration, about 12 *mm* long, at limbus. Abscission. No recurrence after several months. Alveolar sarcoma. Some pigment.

(24) LAWFORD. Man, twenty-eight. Four years previously a small red spot at limbus treated with cautery. Six years later recurrence as large as a pea. Abscission followed by rapid recurrence. Later history not stated. Spindle-cell sarcoma. No pigment.

(25) MATTHEWSON. Man, twenty-two. Tumor at limbus for three years, preceded one year before by an injury. Tumor size of a bean. Associated with metastasis on cheek and later on surface of body generally. Abscission. Melanotic. Small cell. Final result not stated.

(26) MEIGHAN. Man, sixty-three. Small tumor at the limbus following injury. Abscission in three years. After two recurrences finally became very large. Enucleation.

(27) v. MICHEL. (*a*) Woman, fifty-four. Tumor overhanging limbus. Abscission, and in two years recurrence and enucleation. Followed in two years again by recurrence in conjunctiva. Large-cell leucosarcoma. Final result not stated.

(*b*) Man, sixty-three. Flattened tumor extending from the

cornea backwards to the equator, 6 *mm* in thickness. Enucleation. Interior of the eye invaded. Small-cell leucosarcoma. Final result not stated.

(28) MITTENDORF. Woman, forty-six. For less than a year a blackish tumor near limbus. Abscission. In six months multiple recurrences and removal, and in two years again recurrences, preauricular glands, and abscission. Recurrence after the last operation in four weeks. Mittendorf did not expect to save life of patient.

(29) VAN MÜNSTER. (*a*) Woman, thirty. For twelve years a blackish spot a few *mm* from the limbus, which gradually increased and was abscised. Recurrence in one year and second abscission. Again recurrence in one year, but not operated for eight years (enucleation), after which there were three recurrences in lid and orbit within two and a half years. After last removal no recurrence after three months. Round- and spindle-cell sarcoma. Some pigment.

(*b*) Man, fifty-five. Epibulbar tumor removed twelve years before, after which there was gradual growth of pigment throughout conjunctiva, and recurrence of tumor. After third recurrence enucleation. No recurrence after year and a half. Spindle cells.

(30) OLE BULL and GADE. (*a*) Man, seventy-one. Black tumor close to the limbus, size of a bean, of four years' duration. Enucleation. Round cells with pigment. Final result not stated.

(*b*) Man, seventy-three. Small melanotic tumor near the limbus, removed by abscission. Five recurrences, eventually in orbit and parotid region. Enucleation and exenteration of orbit. Spindle cell. Death. Cause not stated.

(31) PAGENSTECHER and GENTH. Man, twenty. Five months after a blow on eye a painful tumor at limbus, which was abscised and recurred in one month, and soon covered the whole anterior portion of the eye. Enucleation. Round-cell sarcoma. Cornea destroyed, except membrane of Descemet.

(32) PANAS. (*a*) Woman, sixty-one. Abscission of tumor near limbus when thirty-three years old. Recurrence in ten years. Again abscission with rapid recurrence. Finally extended from the cornea to semilunar fold. Tumor removed without enucleation. Final result not stated. Melanotic sarcoma.

(*b*) Man, forty-six. Small tumor at limbus for three years. Two abscissions. No recurrence after one year. Melanotic.

(*c*) Man, seventy-one. Tumor at limbus. Abscission. No recurrence after several months. Melanotic.

(33) PFINGST. Injury three years before, which left a red spot on conjunctiva, which developed into a tumor, encroaching on cornea. Twice abscised and recurred. No recurrence after last operation after two years.

(34) REMAK. Woman. Pedunculated tumor at limbus, of three years' duration. When operated was as large as a small apple. Three abscissions and finally enucleation. Final result not stated. Melanotic.

(35) REID. Man, forty-five. Small black spot at the limbus. Abscission, and after five recurrences enucleation. Alveolar melanosarcoma.

(36) ROBERTS. Tumor at limbus. Abscission and recurrence in two years. Melanotic.

(37) RUMSCHEWITSCH. Man, sixty-one. Tumor from cornea. Enucleation. Final result not stated. Spindle and round cells.

(38) SCHIESS–GEMUSEUS. Man, seventy. Tumor at limbus as large as a bean. Abscission. Partly pigmented. No recurrence after one year.

(39) SCHMALZ. Woman, sixty-nine. Tumor at limbus. Also preauricular gland. Abscission. Round-cell sarcoma. No note as to recurrence.

(40) SCHMID. Woman, twenty. Tumor covering entire surface of cornea. Enucleation. Small-cell sarcoma. No note as to recurrence.

(41) SCHOEN. Woman, twenty-five. For three years small black speck near the cornea. Presented tumor as large as a bean. Abscission. Melanotic sarcoma. Also small tumor near caruncle. Abscission. Melanotic sarcoma. Recurrence in eight months. No return after "long interval."

(42) SCHULTZE. (*a*) Child, fourteen. Small tumor at limbus in each eye. Abscission. Round cell. Melanotic. No recurrence after six months.

(*b*) Woman, sixty-one. Tumor involving one third of limbus, of three years' duration. Melanotic spindle-cell sarcoma. Recurrence in one year and second abscission. Followed in two years by recurrence in lid and orbit. Enucleation and exenteration of orbit. Final result not stated.

(43) SCROCZINSKY. (*a*) Man, sixty. On conjunctiva and

limbus. Reddish, size of a bean. Abscission and no recurrence after one year.

(44) SEIDERER. (*a*) Woman, fifty-eight. Multiple melanotic tumors at and near limbus. Enucleation and recurrence in two and a half years in lids and orbit. Exenteration. No recurrence after four years. Round and spindle cells. Melanotic.

(*b*) Small tumor near limbus, of six years' duration. Abscission and in two and a half years recurrence, covering entire cornea. Preauricular gland. Exenteration of orbit. Death in two and a half years from supposed general metastases.

(45) SILEX. (*a*) Woman, sixty-three. For ten years small black spot at limbus. Rapid growth within two months to size of a hazel-nut. Abscission. Repeated recurrences in plica and lids. And doubtful tumor in abdomen (for three years). Melanotic round-cell sarcoma.

(*b*) Woman, sixty-four. Tumor at limbus 5 *mm* in diameter, of nine weeks' duration. In one year recurrence, and second abscission. Followed by second recurrence at limbus, also in lids. Melanotic round-cell sarcoma. After history not known.

(*c*) Man, twenty-nine. Tumor at limbus 6 x 8 *mm*. Enucleation after three abscissions. Melanosarcoma. Final result not noted.

(*d*) Man, forty-nine. For two years black spot at limbus. Tumor finally covered entire cornea. Abscised three times. After fourth recurrence (seven years), enucleation. No recurrence after eight months. Melanotic round-cell sarcoma.

(46) SGROSSO. (*a*) Man, fifty. Small spot in conjunctiva for thirty years. Rapid growth within three years, finally involving anterior segment of eye and orbital and palpebral conjunctiva. Exenteration of orbit. Melanotic. Final result not stated.

(*b*) Man, forty. Small tumor at limbus as large as a pea for five years. Then second tumor also at limbus. Abscission first. Finally enucleation. Small-cell leucosarcoma. Final result not stated.

(47) SOCIN. Man, sixty-one. Non-pigmented tumor near the limbus. Abscission and recurrence in six weeks. Enucleation and no recurrence after eight months. Round- and spindle-cell sarcoma.

(48) ST. JOHN. Man, seventy-two. Tumor at limbus as large as a pea, of two months' duration. Abscission. Spindle-cell leucosarcoma. No note as to recurrence.

(49) STORY and GRAVES. (*a*) Man, fifty-four. Tumor at

the limbus. Abscission. Recurrence with preauricular gland. Second operation. Death in four years from general metastases. Melanotic alveolar sarcoma.

(*b*) Man, seventy-six. Pigmented tumor at limbus. Enucleation (?). Spindle-cell sarcoma with pigment. Final result not stated.

(*c*) Man, fifty-seven. Tumor starting at the limbus, finally covering the entire cornea. Enucleation. Melanotic spindle-cell sarcoma. Final result not stated.

(50) STROUSE. Woman, seventy-two. Tumor at limbus as large as a hazel-nut, of gradual growth. Abscission. Recurrence yearly for three years. Final result not stated. Large-cell sarcoma with some pigment.

(51) SZULISLAWSKI. Man, fifty-five. Tumor at the limbus of one year's duration. Abscission and recurrence in one year affecting the upper lid from supposed implantation. Small-cell melanosarcoma. Final result not stated.

(52) VOSSIUS. Man, sixty-seven. Small spot near limbus for three years. Rapid growth within half a year. Enucleation. Spindle-cell sarcoma with some pigment. No note as to recurrence.

(53) WADSWORTH and VERHOEFF. Man, eighty-two. Tumor at limbus 12 by 11 *mm*, beginning one year before as small spot. Enucleation. There was also a small sarcomatous growth on lower lid from supposed implantation. Melanotic giant-cell sarcoma. After result not noted.

(54) WEINBAUM. (*a*) Woman, forty. Tumor at limbus as large as a pea, beginning one year before as small brown spot. Also numerous brown spots throughout bulbar conjunctiva. Abscission and multiple recurrences. After two years recurrence as large as walnut. Enucleation, followed in one year by recurrences in orbit and general metastases and death (autopsy). First tumors melanotic ; later, leucosarcoma.

(*b*) Man, twenty-six. Tumor as large as a pea near limbus, of one and one half year's duration. Abscission and no recurrence till after six years. Second abscission. After which no recurrence as long as patient lived (ten years). At first leucosarcoma. Recurrence melanotic.

(55) WIEGAND. Man, seventy-seven. Tumor near limbus as large as a pea, of a few months' duration. Enucleation and recurrence in lid and submaxillary region after six months. Round-cell melanotic sarcoma.

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# THE ACCURACY REQUISITE IN VISION-TESTING.[1]

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FOR the purpose of estimating the aberration of refraction in vision-testing, our objective methods of examination, as yielding more exact and reliable data, must take precedence over the subjective procedure. The latter, however, cannot be overlooked, as it is of inestimable value both independently and for corroboration, and, as such, forms the initial step of any investigation. On those occasions, which are numerous, when it does not fully remedy or explain the defect in vision, the case ought in every instance to be submitted to the objective method. More than one system for this is at our disposal: there are the ophthalmoscopic methods, both the direct and the indirect (or Schmidt-Rimpler method), the use of the ophthalmometer (Javal–Schiötz or other make), as well as retinoscopy (or the method ascribed to Cuignet). Principal reference will be made here to the last-mentioned as being the one most frequently used, which may, besides other reasons, be owing partly to its advantages when employed even under unfavorable circumstances, such as difficulty caused by restlessness of the patient, or, on the other hand, fatigue on the part of the surgeon.

There are certain points in the use of this form of retinoscopy which, though not always observed, are of essential service in achieving a uniform standard of accuracy in the

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results elicited. The first and most important of these is the care which should be given to bringing the optical centres of the trial-lenses into exact coincidence, so far as is possible, with the axial line of vision of each eye. The trial-frames used for holding the lenses in position should be preferably those whose parts are movable by rack and pinion, and are supplied with a scale indicating the measurement of position, both in the horizontal and vertical directions. It is a matter of regret that the trial-frames are frequently adjusted to the patient in a haphazard way, which tends to produce inaccurate results, as the lenses, being decentred, act incorrectly as prisms instead of in their normal spherical purpose. It is also essential, in any subsequent examination of the eyes, either for further investigation or comparison, and which may be either subjective or objective, that the lenses should be made to assume an exactly similar position in relation to the eyes as on the original occasion. The surgeon is also thereby enabled, when ordering spectacles, to furnish the optician with exact particulars for the frames; and it permits due attention being given to, and allowance made for, the changes in measurement associated with the natural growth and expansion of the face in young subjects. The record further serves as a basis for defining the different degrees of separation between the lenses before the two eyes, according to the purpose for which the glasses may be required, such as for far or nearer distance, or for close work. A ready and simple means, adapted to facilitate and ensure accuracy when thus measuring the exact position of the pupillary centres, is found in the use of a cross-bar pupillometer with the trial-frames, as described in the *Lancet* (1900, vol. i., p. 627), slightly modified, or some similar device to serve the same purpose.

Although a cycloplegic is not always employed for making this objective examination of a patient, one should always be used, in order to get a fully correct result, unless it is otherwise strongly and distinctly contra-indicated. Here again the circumstances of the case are not always sufficiently regarded, and not infrequently atropine in solution is heedlessly and almost indiscriminately used, when a milder

and more quickly transient effect would amply suffice; the consequence is that the professional or other skilled worker, or the ordinary artisan, is unnecessarily inconvenienced for a considerable period from efficiently following his daily occupation, which in many instances, and especially amongst hospital patients, may be his sole means of gaining livelihood.

An additional point is the correct estimation of the position of inclination of the cylindrical aberration, when astigmatism is present. Entire reliance for this is usually placed on the subjective examination, whereas it can be readily found objectively, and the surgeon should always hold it as his office to do so. When the total error has been fully corrected, the cylindrical lens only needs to be rotated in the trial-frame until a completely emmetropic effect of shadow-movement becomes apparent in response to the excursions of the retinoscopy mirror. This observation, if carefully made, will usually be found correct when verified afterwards by means of the astigmatic ray-chart. Before the patient is moved away from the lamp, the methodical examination of the interior of the eye should never be omitted, as errors of judgment are then much less apt to occur.

Whilst the pupil is still dilated and the accommodation relaxed, it is always advisable to take the opportunity of making a subjective examination in corroboration, so that, if any discrepancies are found, immediate reference again to the objective method is quite easy. Such an examination is feasible and so far satisfactorily accomplished by using with the trial-lenses an operculum before each eye, having a central circular aperture corresponding to the size of the pupil when moderately dilated. The results thus attained serve as an approximately close guide for the final subjective test of vision, when the eye has recovered from the effects of the cycloplegic and returned to its normal state.

Often a very little care bestowed on a point of detail will discover and overcome the cause of defects which may have been previously regarded as being irremediable, inherent, or functional.

When the nature and degree of the refractive error have been discovered by the objective method of examination, and the fundus explored for any abnormalities, the subjective test for vision can be completed. For this purpose the optotype designed by Dr. Edmund Landolt, of Paris, and described in the *Annals of Ophthalmology*, U. S. A. (vol. x., p. 207), are those best adapted for universal acceptance. That there is distinct need of general and, if possible, world-wide uniformity on this point, is an axiom which cannot be seriously disputed, as it is only by such exact means that accurate and reliable comparison can be made with regard to the condition and results obtained in the treatment of cases, whether occurring amongst people of varied stations in life, or with differing degrees of scholastic training, and wholly irrespective of their individual age, race, or nationality. These optotype are equally available for the fully educated as for the illiterate, for young children as for adults, and for those the characters of whose language are written from left to right, as for those where they run in the reverse direction. When the suitability of the optotype for their purpose has been fully recognized, an easy and most useful standard will thus be established, which should effect still greater cohesion amongst ophthalmic workers and add interest to the results which they obtain.

The only point in which these optotype will bear simplification without detracting from their value, and thus perhaps bring them more readily into favor, is by confining their use to the four positions in which the hiatus of the circle is directed exactly upwards, downwards, and to either side, thus , and omitting those other four forms where the opening is placed at a position of 45° angle. In practice it is found that the latter do not admit of such clear and ready interpretation, even by patients of ordinary intelligence and education. When the position of the test-board is simply altered, it at once changes the reading of the optotype characters, the gap in each circle pointing in a fresh direction without the character undergoing any other change in form; thus sufficient variety is always available, obviating any possibility of their being committed to memory by

rote, and consequently interfering with their usefulness as a test.

Still further accuracy would be obtained, and absolute similarity be ensured, if the illumination of the test-board could, for the purposes of standard comparison, always be of the same uniform intensity. This can only be secured by the use of artificial lighting, in preference to daylight, and it should be of specified candle-power strength and without the use of a reflector to increase it. Even in countries where there is uninterrupted sunshine, the natural intensity of the light is never constant throughout the day, as it varies in accordance with the hour and also with the different seasons of the year. It is further affected by the aspect of the room which is used for the examination, the size and number of the windows, as well as their relative position to, and distance from, the test-type board. All these considerations are at once eliminated by the use of artificial light of given power, which is screened from the observer and placed in a definite position with relation to the optotype.

The due appreciation of color-sense is a further important element, which, for practical purposes, must often enter into the visual examination. This is most requisite in the cases of those employed on railways, or in navigation, or any other occupation where there is either temporarily or continuously, insufficient daylight; and the directions for general safety, mutual benefit, or other purpose, are given by means of colored lights. Those commonly in use are four in number,—a clear bright light, also red, green, and violet-colored lights. Therefore, if an individual can satisfy us that these can be quickly and readily recognized in a practical manner, we may consider the case fitted, in this particular, for the foregoing occupations, and without any real need for us to enter into further detail, although there is nothing to prevent this being done whenever necessary. The ideal method of course is to reproduce the exact conditions under which the individual works, artificial light being used and the various colored glasses interposed in front of it, a piece of frosted glass being also introduced for the purposes of confusion. A disc in which these glasses are mounted revolves, in front

of an aperture, on the ordinary shield which screens the ophthalmoscopic lamp; the degree of illumination can be modified by using an iris-diaphragm to vary the size of the aperture, or an additional disc for the purpose, placed on the same axis, may have a series of holes pierced of graduating size, ranging from 1 to 6 *mm* or larger. When such means are not available, an equally practical method for testing this power of color discrimination, is to employ a series of rounded pieces of paper of the corresponding colors, placed on a dark background; their sequence and relative position to each other can be easily changed by altering the position of the board, as in the use of the Landolt optotype. It does not detract from the practical value of this test, to indicate in the first instance to the individual who is being examined, the respective names of the colors, as their relative position to each other is afterwards very readily changed, and it is their instant recognition, and not their matching or comparison, which is requisite.

The various apparatus which have been mentioned are made by the Anglo-American Optical Company of London and New York. The optotype test-board and color-chart are conveniently combined on a three-sided drum which can be turned on its long axis; this is preferable to a drum with four or more sides, as only one surface can be seen at a time, and there is consequently no uncertainty. Two of the sides of the drum show differing settings of the optotype, and as it can be suspended with either end or side upwards, several entirely different dispositions are thus produced: the optotype are placed linearly in a series of graduated sizes, and a model of the largest of them is supplied with the drum, so that the test can be made intelligible to any one; the color-chart, occupying the third side, similarly presents four different arrangements, which is found sufficient to produce confusion when desired.

The whole question is one deserving of more attention than it often receives; it is of the first importance and not a negligible duty, because it is the principal evidence which can be adduced in support of the results of any particular treatment or other measures,—surgical, remedial, or prophy-

lactic; and it should always be so carried out that statements can be made, entirely devoid of ambiguity, in order that absolute reliance can be placed on them, thus permitting of their free use for the purposes of comparison. This applies equally to every country and to people of all conditions of civilization.

# THE OPHTHALMOSCOPIC APPEARANCE OF THE ORA SERRATA AND THE CILIARY PROCESSES.[1]

By Dr. M. REIMAR, Brunswick.

(*With Plate IX. of Vol. XLI., German Edition, 1900.*)

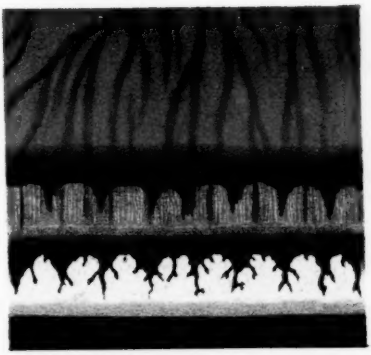
Translated by Dr. Ward A. Holden.

In his paper on the anterior limits of the visible fundus, Groenouw (*Arch. f. Ophth.*, xxxv., 3, p. 29) comes to the conclusion that the extent of retina visible does not depend upon the cornea and its curvature, nor upon the size of the pupil except when this is very narrow, but almost entirely upon the location of the anterior surface of the lens in relation to the corneal margin, — that the ophthalmoscopic field extends farther forward the nearer the lens lies to the cornea or the shallower the anterior chamber. Both by computation and empirically, he finds the distance from the margin of the cornea to the limits of the visible fundus 7.6–9.8 *mm* or on an average 8.5 *mm*. Groenouw did not go into details regarding the conditions in aphakia after extraction, because the secondary cataract interferes with the accuracy of the measurements.

From Groenouw's paper one obtains the idea that in aphakia the extent of fundus visible depends only upon the width of the pupil, and the influence of the pupil in this case is the greater because the iris is not pushed forward by the lens but forms a flat diaphragm.

But even when the pupil is dilated ad maximum the iris will restrict the ophthalmoscopic field. When, however, the

[1] From the University Eye Clinic at Zurich.



*Ora serrata.*

*Orbiculus ciliaris.*

*Corona ciliaris mit Processus ciliares.*

*Dr Reimar fec.*

Lith. Anst v. H. Jonas, Cassel. Verlag v. J. F. Bergmann, Wiesbaden.

iris is wanting up to its periphery, either at one spot or in its entire circumference, the extent of the field will depend solely upon the optical relations of the cornea.

In examining the fundus of a patient on whom extraction with iridectomy had been done, I found the ora serrata, and then it occurring to me that one should be able in such an eye to see the ciliary processes I found that this was feasible. In general there are technical difficulties in the way. The coloboma must extend to the periphery and the secondary cataract must be thin or cut through in order that a view of the ciliary processes may be obtained. Further, one must look into the eye very peripherically. If the coloboma is upward, the patient must sit on a high stool, throw the head back, and turn the eye upward, while the upper or lower lid is retracted; the observer must sit on a low stool much below the patient — positions which are uncomfortable for both. It is probable that the examination could be better made with an electric ophthalmoscope while the patient was in a reclining posture.

In time I found several cases in which the examination was possible owing to favorable circumstances, and I obtained sharp and extensive images of the most anterior positions of the interior of the eye. Although these observations at present have no directly practical value, I believe that they are of sufficient theoretical interest to warrant their description.

The periphery of the fundus is characterized first by a diminution of pigmentation, causing the parts to appear of a paler red, while the choroidal vessels become fewer in number and more meridional in course.

Farther in the periphery appears a stripe of pigment concentric with the equator, which begins with small clumps of pigment which become more numerous to form a regular closely granular band. From this band processes of pigment extend forward, forming remarkably regular arcades.

The intensity of pigmentation of this circular band and its processes varies considerably in different persons, and the band appears narrower or broader, and the processes shorter or longer. The color ranges from dark brownish-green to light grayish-brown. Frequently there appears, particularly

over the portion of the band lying farther back, a bright silvery-gray shimmer.

This circular band of pigment with its processes represents the ora serrata, which appears more conspicuous than in the divided eye. The silver-gray shimmer perhaps represents the beginning zonula.

The zone peripherial to the ora serrata has a paler choroidal red color than the zone toward the equator. In it are numerous meridional fine irregular yellowish-white stripes. The choroidal vessels run almost exclusively meridionally. They are covered by the pigmented band at the ora serrata, but emerge to view peripherally to the band.

Farther peripherally lies a second stripe of pigment concentric with the equator, which is composed at its margin of small clumps of pigment and then becomes more homogeneous. It exhibits the same variations of intensity of pigmentation as the other stripe, and frequently exhibits also a similar silvery shimmer. From this band of pigment peculiar pronged processes of pigment extend peripherally, showing a parallactic displacement as respects the pigment band. These are the ciliary processes which could be seen in the inverted image almost always if they could be recognized as silhouettes with transillumination.

One difficulty in seeing the ciliary processes lies in the great difference in level between them and the orbiculus ciliaris in the direction of the line of vision, since one must look very obliquely into the eye. After obtaining a clear image of the orbiculus, one sees at first a greatly magnified image of the ciliary processes, and a clear picture is obtained only when the lens is withdrawn farther and thus the field enlarged and the image of the processes made smaller.

In consequence of the great difference in level, the parallactic displacement of the ciliary processes in respect to the orbiculus is greater, the nearer the ciliary processes are to the focus of the lens, and this also at first renders the recognition of the picture difficult.

There is difficulty also when one views parts farther forward, for the root of the iris remaining in the coloboma appears as a dark shadow whose nature is recognized only

when focussing is accurate. The figure on Plate ix. explains these conditions better than a long description would.

Magnus (*Arch. f. Ophth.*, xxxv., 3, 1, 1889), in his paper on the periphery of the fundus, alludes to the ciliary body, but I believe that he has not understood the topographical relations rightly.

In eyes containing a lens I have occasionally been able to see the beginning of the pigmented band of the ora serrata, but never the arcades or the parts lying farther forward. But this is possible, as Magnus's observations show, when the conditions are favorable — the axis of the eye being long or the lens lying far forward.

The ciliary processes, however, can never be seen in the eye containing a lens, this being optically impossible since the lens is attached to them at its equator.

The effect of the width of the pupil in the aphakic eye is shown most clearly when we compare the extent of the field in the region of the coloboma with that where the iris still is present. In the latter case one may see at the most the beginning of the pigment stripe of the ora serrata. Therefore portions of the iris remaining after iridectomy limit the extent of the ophthalmoscopic field greatly.

Like Magnus, I found frequently in the periphery of the fundus changes consisting in more or less extensive choroidal atrophies, and pigmentary changes consisting in rarefaction at some points and accumulation at others. I agree with his view that the frequency of these changes is in direct relation to age and anomalies of refraction. In myopia of high degree focal atrophies of the choroid are rarely absent.

*Explanation of the Figure of Plate IX:*

Since it was not possible to give sufficiently the effect of relief when the ciliary processes were drawn in the colors given in the description, they are here represented almost colorless.

# ON INDIRECT RUPTURES OF THE IRIS.

By Dr. GEORG LEVINSOHN, Berlin.

Slightly Abridged Translation by Dr. Ward A. Holden from the German Edition, XLI., 1, March, 1900, p. 79.

REPORTS of indirect ruptures of the iris, apart from iridodialysis, have been rare. In the last publication on this subject by Weiss and Klingelhöfer (*Arch. f. Augenheilk.*, 1899), the total number of ruptures of the sphincter reported is given as 31, and of ruptures of the continuity of the iris as only 8. It seems desirable therefore to report new cases even for the purpose of increasing the statistics, and particularly because it is believed that ruptures of the sphincter are relatively much more frequent than the number of published cases would lead one to suppose. The views now held as to the mechanism of these injuries particularly led me to go into the matter again. For these views explain so little and are so divergent and even contradictory that they certainly deserve a critical discussion in order to make the matter clearer.

A number of new cases of indirect rupture of the iris follow:

Case 1.—E. M., aged twenty-nine, complained of mild conjunctivitis. Nine years before a horse-shoe struck the left eye with considerable force. He stated that for the following two weeks he could not see with this eye and was obliged to remain in the hospital six weeks. In both eyes there were residua of trachoma-pannus and white conjunctival scars. The left pupil exhibits on the nasal side and above three small incurvings, in two of which the pigment border of the iris is broken through and in the other

narrowed. The left pupil is slightly larger than the right and responds to light and in accommodation. It dilates after the instillation of cocaine, but the nasal portion remains narrower and irregular in outline. Under eserine it contracts to 1.5 *mm* and the incurvings then appear as narrow clefts.

Here we have after a contusion of the eye three ruptures of the pigmented pupillary margin, two extending entirely through it, and from the form of the pupil the sphincter has undoubtedly been injured. The dilatation of the pupil so caused is very slight, and sphincter and dilatator exercise their normal function.

Case 2.—M. A., aged forty-one, a merchant, was struck in the eye by a lead shot from a "catapult." A physician who was at once consulted made instillations and bandaged the eye. Eight hours after the injury we found the condition as follows: moderate ciliary injection, moderate sensitiveness, T — 1; an erosion at the lower margin of the cornea; the pupil of medium width; the iris broader below than above and exhibiting traces of blood. A lead shot 4.5 *mm* in diameter was removed from the swollen conjunctival sac below. After the instillation of atropine the iris became still narrower above, but did not contract in its lower portion. The fundus was slightly veiled by a pupillary exudation, but exhibited nothing pathological.

The following day the pupillary exudation was partially absorbed and had a gelatinous character. Its upper margin was convex and corresponded to the upper margin of the pupil; the entire mass was of a pale yellow color and resembled a slightly cloudy lens dislocated downward. On the following day the exudation had shrunk considerably and on the day after that it had disappeared. The other inflammatory symptoms passed off and the tension became normal. The retina then appeared to be hyperæmic with many hemorrhages and one circumscribed gray patch upward and outward.

A few days later the iris had taken on a greenish hue, due to the absorption of the blood lying upon it. As a precautionary measure, however, the sideroscope was used, but no movement of the needle occurred.

Two weeks later the appearance of the eye was normal except that the iris remained broader in its lower portion than in its

upper. With oblique illumination one could see near the ciliary margin in the widest portion of the iris several small perforations, four of which looked as if they had been made with a needle and two having more of a cleft shape. It is uncertain whether these perforations had been present some days before, but they did not exist in the days following the injury and probably developed only when the exudation was absorbed. Downward and outward the pigmented margin of the iris was interrupted for 1.5 *mm*, as was particularly evident when the pupil was small. The fundus changes partly cleared up in two weeks.

Fourteen months later the condition was as follows: Right pupil elliptical, 5 *mm* in lateral diameter and 4.5 in vertical, while the round left pupil is 4.5 *mm* in diameter. After the instillation of cocaine the horizontal diameter in the right eye increased to 6 *mm* and the vertical to 5, while the non-cocainized left pupil measured 3 *mm*. After the instillation of eserine the horizontal diameter measures 2.5 *mm* and the vertical 2 *mm*, the defect in the pupillary margin being very evident. The lesser vertical diameter under all conditions is explained by the diminished retraction of the lower portion of the iris. The changes in the fundus have almost disappeared.

R. with — 1. — 1. cyl V = $\frac{1}{2}$? L. E. V = $\frac{1}{4}$?

This was a case of severe contusion of the eye followed by a slight rupture of the pupillary margin of the iris and multiple perforations of the iris in the region of the dilatator. The former by its effect upon the sphincter caused a slight dilatation of the pupil, and the latter by its injury of the dilatator caused a contraction of the pupil. Hence the peculiar form of the pupil, whose vertical diameter remained equal to that of the other eye while the horizontal diameter became greater.

Case 3.—T. B., aged forty-two, a roofer, stated that in hammering three days before a piece of slate struck the right eye and that since then his sight had been poorer. Right, slight purplish discoloration and swelling of both lids. A slight abrasion of the skin at the middle of the infraorbital margin. Moderate ciliary and conjunctival injection. Remains of small conjunctival hemorrhages about the cornea. The ciliary region sensitive to pressure. Tn. Cornea clear except for a faint linear opacity

in its centre. The pupil of medium size, slightly elliptic, the long diameter from down and in to up and out being 6 *mm*, the other 4.5, while the diameter of the left pupil was 3.5. When carefully observed, one could recognize down and out one rupture of the pupillary margin and up and in three ruptures, none more than 0.5 *mm* deep. With a loupe the pupillary margin here is seen to have an arcade-like appearance, yet the pigment line is completely broken in the lower rupture only, while in the upper rupture a fine brown line preserves its continuity. Moreover, the pupil otherwise is not quite regular but rather wavy in outline. On the anterior capsule, chiefly in the quadrant corresponding to the upper rupture, one sees a number of small points of pigment.

The light reaction is preserved, but is scarcely recognizable. The contraction is uniform at all points. Under cocaine the long diameter of the pupillary ellipse becomes 8 *mm*, while the short diameter scarcely increases at all. Eserine contracts the pupil and renders it almost round, when three of the upper ruptures become deeper and readily visible. The diameters are 3:2.5 *mm*. After atropine the pupil becomes somewhat rounder, but the elliptical form is preserved—8:7 *mm*. When cocaine is added, dilatation increases to 8.5:8 *mm*. The ruptures are then barely to be made out with the loupe.

In the fundus there is a hemorrhage as large as the disc, and near the temporal margin of the disc. At the nasal margin the retina is cloudy and striated, and the inferior retinal veins are tortuous. Otherwise the fundus, and particularly the macula, is normal.

R — 4, $\frac{5}{16}$. Schweigger's test-type 0.6:18 *cm* p.p.
— 2. Schweigger's test-type 0.6:30 *cm* p.p.

Field of vision normal, except for the presence of a small scotoma inward from the blind spot.

In the following days the eye became white and free from irritation, and the sensitiveness to pressure passed off. The mydriasis continued and even increased, so that seven weeks after the injury the pupil measured 6:5.5 *mm*, the oval shape having become almost round. The light reaction is more pronounced, but still much less than that in the other eye.

R $\frac{4}{15}$? — 0.75, $\frac{4}{7}$. Schweigger's test-type 0.6:26 *cm* p.p.
— 2. Schweigger's test-type 1.25 *cm*: 60 *cm* p.p.

After eserine the right pupil becomes elliptical as before, 3:2 *mm*.

Only faint traces remain of the hemorrhage near the disc, but now a rupture of the choroid concentric with the disc is seen inward and below the disc.

In this case we found after contusion of the eye:

1. Multiple ruptures of the pupillary margin of the iris with mydriasis which was particularly marked in the direction corresponding to the ruptured parts. Cocaine at first affected the broader portion of the iris but slightly. Eserine, however, affected the entire iris uniformly. Later the iris detracted still more, and the pupil lost its elliptical form and became almost round.

2. Increased accommodation, increased myopia, the near point coming nearer the eye. This condition passed off in the course of seven weeks.

3. Rupture of the choroid.

The literature of indirect rupture of the iris was collected by Franke and brought down to date by Weiss and Klingelhöfer. The first question to be considered is that of the mechanism of this injury.

Franke believed that the force acting upon the eye first produced a spasm of the sphincter and then, through the flattening of the eye, an enlargement of the sclero-corneal ring. The result was the multiple rupture of the tense sphincter iridis.

This view does not correspond to the facts.

Before all it must be remembered that, almost at the same instant in which the force acts upon the eye, the flattening of the eye and the widening of the sclero-corneal ring follow; the difference in time is so slight that both may be considered simultaneous.

This, however, is not the case as respects the contraction of the iris. One may conceive that this occurs in a reflex way after the cornea has been compressed. Therefore it must take place later, long after the sclero-corneal ring has been widened and the iris retracted at its periphery. The production of this reflex requires a small though not negligible period of time, as in the case of the pupillary reaction to light; or the sphincter is excited to contraction as soon as the force acts directly upon it. This moment coincides

with the broadening of the iris ring. But a muscle does not contract immediately upon excitation, for there is a short interval—the so-called latent stage—before contraction begins. The contraction of the pupil, therefore, can only occur after the widening of the sclero-corneal ring has occurred.

Franke's explanation, therefore, is impossible. But even a priori it would be difficult to explain the occurrence of multiple ruptures in this way. For with a tense elastic membrane and an outer force acting upon the end which chiefly exerts the tension, the result would be not multiple ruptures but a single gaping rupture which Schirmer believes should not be perpendicular to the pupillary margin, but parallel to it.

Weiss and Klingelhöfer also object to Franke's view, although they admit as a possible point in its favor the fact that in Clark's case the rupture of the iris corresponded to an opacity of the lens more centrally located.

A similar condition existed in our Case 3, a bit of pigment that had been thrown off lying in the centre of the pupil and at some distance from the pupillary margin. But this condition is not extraordinary. One might conceive that the pupil at the time of the contusion was greatly contracted, since these injuries usually occur in bright daylight and when the patient is at work — light and accommodation making a small pupil probable.

Schirmer believes that the trauma forces the cornea backward so that it holds the sphincter fast and the forcing out of the aqueous ruptures the iris. Weiss and Klingelhöfer show that this hypothesis will not explain the cases in which the rupture is opposite the direction of the force and that it is untenable in cases in which the margin of the cornea or the sclera has been struck. Furthermore it is very questionable whether the cornea is forced back until it comes in contact with the lens capsule. Indeed, it is almost impossible.

Fuchs's view, that when the contusion occurs the aqueous humor principally enlarges the sclero-corneal ring and thus ruptures the sphincter by rendering it over-tense, is objected to by Weiss and Klingelhöfer, who state that this explanation could hold good only in cases in which the force acts

upon the cornea from directly before. According to their opinion, there is no great difference between the view of Fuchs and of Franke since each explains the rupture of the sphincter by supposing that it is rendered over-tense.

But in fact the explanation given by Weiss and Klingelhöfer differs but little from the others, since they regard the rupture of the sphincter as being due to over-tension of the sphincter, manifested in a direction perpendicular to the striking force.

In order to understand the production of indirect ruptures of the iris one must analyze the forces at work in cases of contusion. We may consider the anterior chamber as a basin with elastic walls containing water. For, indeed, the increased tension of the aqueous caused by the injury forces the iris so tightly against the lens that the iris and anterior capsule of the lens form a posterior wall to the basin. If pressure is exerted upon such a basin it acts in two manners: first, it flattens the basin and enlarges its limits, and second, its force is transmitted to the aqueous. The first factor has been held by all authors to account for the indirect ruptures of the iris, while the second factor has usually been neglected. Yet it is of great importance.

Franke has used it to explain rupture of the choroid, but has not mentioned it in connection with rupture of the iris, which seems strange. When water in a closed basin is subject to a considerable sudden force, the non-compressible water seeks to escape along the easiest channels and thus works great damage in the least resisting parts, particularly the pupillary margin. Another portion of the iris of slight resistance is the ciliary attachment, where injury is most frequent in cases of contusion. Arlt's explanation of iridodialysis, that the iris is unable to follow the sudden widening of the sclero-corneal ring and therefore is torn, has little probability, for not only is the sclero-corneal ring widened, but the pressure of the aqueous widens also the iris attachment. The fact that the periphery of the iris is not supported by the lens, and therefore is forced backward by the aqueous, does not explain iridodialysis, but renders comprehensible the invagination of the iris described by Foerster.

The main factor in the development of iridodialysis is the ease with which the iris may be torn at this place, where it is thinnest. When the tissues of the iris are altered, rupture may occur at unusual points, as in the following case.

Case 4. A laborer nearly sixty years old had had several attacks of iritis in each eye. With one eye he could only count fingers near-by, there being complete occlusion of the very small pupil. The central portion of the anterior chamber alone remained, the peripheric portion being obliterated. Tension was increased, and the eye injected. The iris was atrophic, particularly below. Because of the severe pain an iridectomy was attempted. It was only possible to remove some peripheric bits of the iris and the pupil was drawn upward. The result was unexpectedly good. The pain ceased, the tension fell, and vision improved, due to the fact that the iris had ruptured in its most atrophic portion, near the lower ciliary margin, and a new pupil was thus formed.

This example shows the great importance of the condition of the iris in respect to ruptures of it, the diminished resistance of certain parts of the iris explaining why in cases of indirect rupture principally the ciliary margin, and, next the pupillary margin, and rarest of all the body of the iris, is affected.

There still remains the question whether the rupture occurs in the direction of the force or perpendicular to it. Franke and Weiss and Klingelhöfer accept the former view. But in our Cases 2 and 3 we found that the rupture of the iris took place directly opposite the action of the force. In the cases of Blank, Clark, and Kazaurow also the site of the rupture corresponded to the direction of the force. However, it is well known that indirect fractures of the skull may lie not only in the direction of the force but also perpendicular to it, and this may also be the case with the eye.

The condition of the pupil is also of interest in these cases of indirect rupture. The condition differs according to the time that has elapsed since the injury. But one can say that in almost every case the pupil is dilated immediately after the injury and then in the course of time gradually

becomes smaller, although some dilatation remains. From this we may conclude that the rupture of the sphincter causes only a low degree of mydriasis, and that the immediate dilatation is chiefly due to paralysis of the sphincter, as in the cases of traumatic mydriasis in which there is no rupture.

Frequently there is also a paralysis of the dilatator and according as one or both muscles are involved there is mydriasis or myosis. Usually there is a temporary paralysis of the sphincter, while the dilatator is involved but slightly if at all. Tests of the pupillary reaction give us the most information in this respect.

The nerves supplying the sphincter are paralyzed by atropine and excited by eserine, and a weak cocaine solution excites the nerves supplying the dilatator. Thus in our Case 3 we had, besides the rupture of the sphincter and the apparent paralysis of the sphincter, also an involvement of the dilatator, since cocaine has almost no effect upon the horizontal diameter of the pupil. The fact that the vertical diameter of the pupil remained the greater both before and after the instillation proves only the greater injury of the sphincter ruptured at this point and the predominancy of the weakened dilatator over it. Later, when the dilatator had recovered, the pupil became wider in the horizontal diameter also, thus making evident the predominancy of the dilatator on all sides. The dilatation of the pupil can be caused not only by the local rupture of the sphincter, but also in part by a general paresis of the sphincter, for otherwise with the demonstrated paresis of the dilatator there would be in the beginning a narrowing of the pupil which at the most, as the reaction to eserine shows, would give place to a slight dilatation in the vertical diameter. We may suppose, however, that, as the paresis of the dilatator passes off in time, gradually the general paralysis of the sphincter is recovered from and the final result, as in our first and in other cases, would be only a slight dilatation of the pupil corresponding to the small ruptures of the sphincter.

Case 2 is characteristic in that, besides the paralysis of the sphincter and the injury of the sphincter through which

a dilatation of the pupil is brought about, there is also a greater injury of the dilatator. Since the effect of the dilatator is wanting at this point, the iris here is considerably broadened. This is most clearly manifest after the instillation of atropine. While the paralysis of the sphincter passes off completely in time, the iris remains broader at this point in consequence of the persisting injury of the dilatator. The result is a pupil broader in the diameter perpendicular to the injured portion of the iris than in that corresponding to the injury of the sphincter and dilatator.

If the paralysis of the sphincter is very marked, as is usually the case in the days immediately succeeding the injury, eserine will not cause the sphincter to contract.

In Meyerhöfer's case eserine has scarcely any effect upon the size of the pupil.

Very peculiar is the explanation of Weiss and Klingelhöfer of a case of traumatic mydriasis, in which eserine in the first days after the rupture of the sphincter caused a marked mydriasis and later myosis. These authors believe the peculiar condition of the pupil to be due to the fact that the shortening of the sphincter when ruptured must cause a dilatation of the pupil and that the reaction to eserine returns after cicatrization. In opposition to this we may say that pupils, when the sphincter is ruptured, are not accustomed to dilate after the use of eserine, as can be seen after iridotomy or iridectomy, and further that, if the supposition of Weiss and Klingelhöfer were correct, it would be impossible to have a contraction of the pupil later. For granted that the connective-tissue bridge caused the approach of the ruptured ends of the sphincter, the connective-tissue band would at once relax and the sphincter act as Weiss and Klingelhöfer suppose, and the pupil become dilated.

The explanation of the dilatation of the pupil in the early days when eserine is used really presents no difficulties. In all probability in these cases there is at first a paralysis of the sphincter with interference with the dilatator. The latter, as we have seen, generally is soon recovered from. Thus we see in the case of Weiss and Klingelhöfer that with increased tone of the dilatator muscle the pupil dilates.

Since the sphincter is still completely paralyzed, it is not in the least affected by the instillation of eserine, and the dilatation under eserine is apparent rather than real. Later when the sphincter regains its function eserine acts as usual and contracts the pupil.

We shall not discuss the question whether there may be paralysis of the dilatator without paralysis of the sphincter. A priori it would seem possible.

Before concluding I should like to add an interesting case, which shows that there may be defects of the iris giving one the impression of being due to trauma, but not being of traumatic origin and probably being congenital.

Case 5.—W. T., a merchant, aged forty-seven.

Excessive myopia in each eye.

R with $-$ 25 D, V $= \frac{4}{25}$; L with $-$ 26 D, V $= \frac{4}{15}$.

In each eye annular posterior staphyloma and central chorioretinitis.

The right eye is said to have had iritis fifteen, ten, and nine years before, but the pupil is round and responsive and there are no traces of posterior synechiæ. It was said that previously there had been detachment of the retina, but now it is everywhere adherent to the choroid.

Both irides present a remarkable condition. First, there were numerous more or less pronounced interruptions of the pigment border, some of which had the appearance of the ruptures of the sphincter seen in the other cases. Second, there was in each eye a larger defect extending at least 1 *mm* into the iris, mostly filled with a gray membrane, and easily visible to the naked eye. In the right eye this cleft lay in the centre of the lower margin of the pupil and had the form of an equilateral triangle, the base of which formed the pupillary margin. In the left eye the cleft lies in the lower-inner quadrant and has the appearance of a rupture which is rather broader at the pupillary margin. There is isocoria and the pupillary reaction is equal on both sides and entirely normal.

These changes in the iris might be mistaken for typical injuries, yet neither eye had ever been injured. The changes in the right iris could be attributed to the previous iritis, if

one assumed that the excessive retraction of the pupillary margin might bring about the injuries. But, on the contrary, we know that ruptures of this sort have never been seen in iritis, that no evidences of previous adhesions are present, and that the same changes are found in the left eye, which had never suffered from an inflammation. One cannot regard these changes then as other than congenital, although it is not possible to say exactly how they arose.

The following conclusions may be drawn:

1. Changes in the pupillary margin of the iris altogether similar to those following contusion of the eye may be found without any preceding injury and are probably of congenital origin.

2. The indirect injuries of the sphincter and of the iris in general are in consequence

(*a*) of the flattening of the anterior chamber and the rupture of its elastic walls thus brought about;

(*b*) of the pressure of the aqueous humor exerted equally in all directions.

3. According to their liability to rupture and their respective elasticity, various portions of the iris are injured with different frequency.

The series is: (*a*) ciliary margin, (*b*) sphincter, and (*c*) the iris proper.

4. Whether the injury occurs on the same side as the trauma or on the opposite side depends on whether the iris offers greater resistance to bursting or to bending. It would seem that the ruptures by bursting are more frequent.

5. The changes in the form of the pupil are the result of the injury to the iris and the paralysis of the iris muscles. Usually there is a marked paralysis of the sphincter and a less marked transitory paralysis of the dilatator. Ruptures of the sphincter in themselves cause only a low degree of mydriasis.

# ON THE ANATOMY OF THE GANGLION CELLS OF THE RETINA.

By Dr. G. ABELSDORFF, Berlin.

(*With eight figures on Plate XI. of Vol. XLII., German Edition, Nov., 1900.*)

Translated by Dr. Ward A. Holden.

A FEW years ago the histological study of the relations and connections of the elements in the central nervous system was so general that little attention was paid to the finer structure of the elements themselves. This course was favored by the Golgi method, which stained the ganglion cells black, and so prevented any study of the cell-body itself. As is usual in histological investigation, advances came with newer technical methods which gave a representation of the inner structure of the ganglion cell. Nissl is chiefly responsible for the new movement, and now the ganglion cells are a favorite field for those studying the histology of the nervous system. A great number of reports have appeared in recent years on the normal and pathological anatomy of the nerve cells, and although the newness of the work precludes final conclusions, and perhaps many of the results obtained will not stand critical controls, still our knowledge has been so increased that we may apply it to the nerve cells of the different organs and to the eye. In ophthalmology, also, the interest of the principal investigators tended toward the connections and branchings of the nervous elements. The brilliant results of such study are best seen in the works of Rámon y Cajal, in

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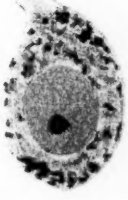

C. Kreß lith. Verlag von J. F. Bergmann, Wiesbaden.

which he traced the tracts conveying the light excitations in the retina.

A detailed report on the structure of the retinal ganglion cells themselves as revealed by Nissl's method was first furnished by Bach, who studied particularly the changes which take place in the ganglion cells after detachment of the retina.

Nissl himself spoke of the importance for pathology of studying the cells of healthy animals, and I wish here to cover a small section of this large field and show by several examples that in the different animals the ganglion cells of the retina differ not only in size but also in structure; which is a further reason why changes obtained experimentally in the cells of one animal should be only reservedly considered to hold good for other animals.

Bach remarked that the arrangement and form of the plasma granules differ in different species of animals, and that it is not improbable that within certain limits differences may be found at different ages.

The essentials of the Nissl method are as follows: The organ is fixed in 96% alcohol, the sections stained in alkaline methylene blue, differentiated in anilin-oil alcohol, and mounted in benzine-colophonium. In nerve cells so treated one can distinguish a formed substance, staining with the basic anilin dye, and an unformed substance. The former appears as bodies of various forms known as Nissl granules, which in a particular cell have a particular arrangement, so that there is offered the possibility of a morphological classification of nerve cells.

In order to study the retinal ganglion cells I fixed retinas in 96% alcohol, cut them in paraffin, and stained them according to Nissl's original directions, and also with saturated aqueous solutions of thionin and toluidin blue after bichloride fixation.

A method equally useful and more simple is that of Rosin, who stained formol sections of the spinal cord with Ehrlich's neutral red. After differentiating with absolute alcohol, the Nissl granules appeared red, the intermediate substance and the nucleus yellow, while the cell membrane

and the nucleolus appeared red. In this manner one obtained a double stain, the basophilic substances appearing red, and the acidophilic yellow.

In order to make retinal preparations after this method, I hardened the eyeballs in 96% alcohol or 5–10% formol. Fixation with alcohol causes folding of the retina, and the preservation of the rods and cones is unsatisfactory, but excellent pictures of the ganglion cells are obtained. Fixation with formol prevents the folding of the retina, and the ganglion cells seemed to be as well preserved as in the alcohol preparations, except that the reticulum of the nuclei was less clear.

After hardening the eyeballs in alcohol or formol, the retinas were detached, saturated with chloroform, and imbedded in paraffin. Celloidin preparations, however, take the neutral red stain equally well. The sections 5–10 $\mu$ thick were floated on the slides in distilled water and fixed, the paraffin was removed, and the specimens lay $\frac{1}{2}$–24 hours in a saturated solution of Ehrlich's neutral red. Overstaining does not take place, but the longer the stain acts the more intense is the yellow coloring of the interstitial acidophilic substance. The superfluous stain is removed by careful washing with distilled water, the sections are dehydrated and at the same time differentiated in absolute alcohol free from acid, cleared in xylol, and put up in xylol-Canada balsam. The preparation and staining of the section are no more difficult than when the ordinary hematoxylin is used. And so far as I can judge, from preparations made a year ago, the stain is well retained, as is shown in the figures on Plate xi., which were drawn from these year-old preparations. The Nissl bodies are actually red, and the intermediate substance is pale yellow and exhibits no fibrillar structure, although this may exist and yet not be revealed by the stain.

I shall begin with the retinal ganglion cells of the frog. Manz has already called attention to the similarity that exists between the ganglion cells and the cells of the inner nuclear layer in the frog. He describes the cells as being pear-shaped, with a long or short stalk. He continues:

"The body of the cell consists of a moderately fine granular mass with a sharp contour, outside of which is frequently found a second delicate membrane. Within the finely granular protoplasm one usually finds a large clear granule, sometimes central, often excentric, which represents the nucleus of the cell, for in the frog I have never found a vesicular nucleus such as is present in other ganglion cells, although this granule corresponds in size rather to a nucleolus than to a nucleus. The stalk of the cell narrows down and passes over directly into the long process where the granular structure ceases and the refraction changes."

According to our present-day conceptions, we must say that all the characteristic components of the ganglion cell are present in somewhat modified form. The protoplasm is but slightly developed, the nucleus is large and vesicular (described by Manz as protoplasm), and constantly contains a nucleolus (described by Manz as a nucleus). Manz's error consisted in mistaking the large nucleus for the protoplasmic cell body, which in reality is attached to the nucleus. The actual conditions can best be made out in fresh preparations stained with Ehrlich's methylene blue. The retina of a freshly killed animal is spread out on a slide with the nerve-fibre layer up, and upon it is dropped a $\frac{1}{10}$ % methylene blue in physiological salt solution. After half an hour the cell protoplasm stains blue, while the large nucleus remains pale and the nucleolus stain dark.

A cell fixed in alcohol and stained with neutral red, which has a relatively large protoplasmic body, is shown in Fig. 1, Plate xi. Such cells are much less frequent than those with still less protoplasm (Fig. 2). Between the two are transition types and also cells with so little protoplasm that they are with difficulty distinguished from cells of the inner nuclear layer. In regard to the finer structure, one sees in Fig. 1 Nissl granules of small size and fairly constant form scattered regularly through the cell body, except for some larger bodies containing vacuoles, and lying near the nucleus. The beginning of the axis cylinder is free from Nissl granules, and the single nucleolus appears homogeneous.

The cells with rudimentary bodies (Fig. 2) contain only a

few Nissl granules in the periphery and near the nucleus, while the nucleus is not homogeneous, but contains many granules of chromatin.

According to Nissl's classification of ganglion cells into those with large bodies surrounding the nucleus (somatochromes), and those in which the cell body is subordinate to the nucleus (nucleus cells), we have in the frog's retina particularly cells of the latter type.

In their structural differences they form an interesting confirmation of what Levi found to hold good for nerve cells in general: The formation of chromatophilic substance (Nissl's bodies) is only well marked in the somatochromic nerve cells and slight in the nucleus cells and granules. The greatest lack of chromatin or nuclein, however, is found in the most fully developed nerve cells.

I have examined also the retina of the toad and of the lizard, and have found the retinal ganglion cells similar to those of the frog.

In the perch and in the pike the cells are quite different. The elongated cell body surrounds the globular nucleus on all sides, and the cell is therefore of the somatochrome type. When stained with neutral red the entire cell-body is closely and uniformly filled with granular or rod-shaped bodies, while the small intervening spaces are occupied by the yellow-colored ground-substance. In Fig. 3 one sees how the bodies extend continuously into the processes of the cells, excepting the beginning of the axis cylinder, which remains free. In the nucleus lies the dark-red nucleolus, and in the perch I sometimes found a double nucleolus.

The ganglion cells of the birds (Fig. 4) that I examined (an owl, *Athene noctua*, and pigeons, *Columba livida* and *risoria*) had a less regularly granular appearance, and resembled more the *tigré* appearance found in the mammalia. The cells in the owl are larger than those in the fishes examined, and the chromatophilic bodies are in general larger, polymorphous, often triangular, and irregularly distributed. In these also the axis cylinder, unlike the protoplasmic processes, is free from the bodies. In the yellow ellipsoid nucleus, surrounded by a smooth membrane, are some spots of reddish-colored

chromatin. The nucleolus is round and of homogeneous red color. That these cells are larger than those in the other animals described, and also contain the largest Nissl bodies, is merely accidental rather than the expression of a general law. The ganglion cells in the pigeon's retina are smaller than those in the owl, their structure is analogous, but the Nissl bodies are at least as large, if not larger.

The somatochrome type of nerve cells of the retina is most beautifully developed in the mammalia.

Fig. 5 represents the ganglion cell of a dog. The Nissl bodies fill the cell body compactly, and are mostly of polygonal form. Some of them have fine processes and irregular outlines. A small zone about the nucleus is often free from Nissl bodies. In the protoplasmic processes the Nissl bodies assume a long spindle shape, with the long axis parallel to the axis of the process. The round nucleus contains but small masses of chromatin and a single large nucleolus.

Fig. 6 represents a cell of similar structure from the rabbit's retina. The similarity to the spinal ganglion cell is less marked than in the dog, but the type is essentially the same. Good representations of the cells in other animals, such as the cat, pig, and calf, are to be found in the papers by Bach and others. The difficulty in obtaining fresh human eyes explains the fact that I have represented but one cell from the periphery of the retina, and have not taken into consideration the regional differences in the cell. Fig. 8 is from the eye of a man, fifty years old, which was enucleated on account of a tumor of the upper jaw and fixed in 10 % formol. The greater portion of the eye was used for other purposes.

One sees very clearly in Fig. 8 the beginning of the axis cylinder free from Nissl bodies; the individual bodies are smaller than in the dog and rabbit, and some lie directly upon the membrane of the nucleus, but in general the zone about the nucleus is free. In the slightly oval nucleus lies a dark, not absolutely round, nucleolus.

Since the introduction of the modern delicate methods of technique, the question has arisen whether the function of the cells is expressed in their morphology, so that rest and

fatigue give rise to different appearances. My experiments on rabbits, like those of Bach's, were negative, and the results did not agree with the reputed positive results of Mann on dogs and Pergens on fishes.

A point to which I should like to call attention is the difference in the ganglion cells of full-grown rabbits and those three or four days old. The young rabbits are doubly blind since the palpebral aperture is closed and the rods and cones are not developed. The ganglion cells, however, are well formed with nuclei and nucleoli, but they are not only smaller than those in the grown animal, particularly as regards the cell body, but they also exhibit a different arrangement of the Nissl bodies. The latter are not regularly distributed through the cell body, but are collected at particular spots, leaving others free. They lie particularly in large clumps between the nucleus and the periphery of the cell.

Although Nissl himself stated that the stained cell was only an equivalent of the living cell, *i. e.*, that it had not the actual appearance of the living cell, but under particular conditions it formed a constant microscopic picture, nevertheless the question has been much discussed whether the Nissl granules are to be seen in the living ganglion cell. This question can be better decided as regards the retina than as regards the spinal cord, because one can study the retinal cells in position without having disturbed them much. Held, who believed that the Nissl bodies were precipitated by the fixing agents, and were present in the living cells in a liquid state, regarded the pictures obtained by the Nissl stain as showing us the internal metabolism of the cell protoplasm in a certain manner modified by fixing and staining processes, and thus gave us in every case a representation of the active material in the interior of the cell. In regard to the appearance of fresh cells in the anterior horn of the cord, he says that one finds a lustrous gray nucleolus with some vacuoles, a homogeneous glassy transparent nucleus with a double contoured limiting membrane, and a more lustrous protoplasm with a few dark granules. This is all that can be observed.

When one spreads out the retina of a freshly killed rabbit with its inner surface uppermost upon a slide, he sees with an immersion lens no more and no less than Held saw in the cells of the anterior horn. In the remarkably transparent cell-substance lies here and there a little granule; the margins of the wholly transparent nucleus are represented by a membrane, and in the nucleus lies the more lustrous nucleolus. A fibrillar structure such as Schultze pictured in the fresh ganglion cells of the ora serrata in the ox, but did not find in the macular cells in man, could not be found in the cells of the rabbit. Schultze speaks of the fibrillar structure of the retinal cells with great reserve: "The cell substance is probably fibrillar and contains also an interfibrillar granular substance, but the transparency of the cells in life is so great and the fibrillæ so fine that the picture is much less clear than that of the spinal cells." He speaks of coarse granules appearing in the dead retinal cells, and I could see plainly in the rabbit's retina that after the cells were dead polymorphous, opaque formations appeared which greatly resembled the Nissl bodies. From these observations, as Flemming stated in discussing Held's investigations, one cannot be positive that the Nissl granules are not present in the living ganglion cells, but only that they are not visible. There are other histological examples, as Flemming stated, which show many things in the cells which are invisible in life, not "biophanous," but still are vitally preformed.

### Explanation of the Figures on Plate XI.

Figures 1–7 are from paraffin preparations, 8 is from celloidin. All are stained with neutral red. Zeiss $\frac{1}{12}$ im. Oc. IV.

Figs. 1 and 2.—Ganglion cells of the frog's retina.

Fig. 3.—Ganglion cells of the perch's retina.

Fig. 4.—Ganglion cells of the owl's retina.

Fig. 5.—Ganglion cells of the dog's retina.

Figs. 6 and 7.—Ganglion cells of the grown and of the three-days-old rabbit respectively.

Fig. 8.—Ganglion cells of the human retina.

# A CONTRIBUTION TO THE DIFFERENTIAL DIAGNOSIS BETWEEN GLIOMA OF THE RETINA AND PSEUDOGLIOMA.

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Translated, by Dr. WARD A. HOLDEN, from Vol. XLVI., 2 (1902), of the German Edition.

IN the early years of childhood, glioma and the cases designated by the collective name "pseudoglioma" are fairly frequent. Many statistics have been published, of which Wintersteiner's is of most value. He found in 498,057 patients 203 cases of glioma, or 0.04 %. The percentages found by Hirschberg, Fuchs, and Freudenthal are 0.01 % higher. The still higher percentages of Pflueger, Holmes, and Vossius may be explained by the fact that to obtain reliable statistics of diseases which are rare and not easily diagnosed an extensive material is necessary. In the eye department of the Buda Pesth hospital, among 56,839 cases seen in nine years, there were six cases of glioma, a percentage of 0.01.

As opposed to these figures, Mohr diagnosed in the Bródy-Adel children's hospital eight cases of glioma in 5164 patients, and in seven an operation permitted the confirmation of the diagnosis. This high percentage is due of course to the fact that all his patients were children. Among 2319 patients that I have treated in the municipal hospital, only one case of glioma was found, or a percentage of 0.04. Thus the frequency of this affection varies, according to the age of the persons from whom the statistics are derived.

There are no satisfactory reports as to the frequency of the cases collectively known as pseudoglioma, yet, according to

my experience, they are frequent. Only cases should be considered in which the eyeball has been enucleated under a wrong diagnosis, and when opened found to contain not a tumor but the products of chronic inflammation.

The frequency of such cases is shown by the following statements. Raab found in O. Becker's great collection twenty eyeballs enucleated for glioma, of which eight exhibited merely signs of inflammation of the uveal tract. Vetsch collected twenty-four cases of glioma, in which a wrong diagnosis had been made in two, while in one a diagnosis of cicatricial formations after irido-choroiditis was made and when the eye was opened a glioma was found. Treacher Collins reported on 1024 eyes enucleated in the course of four years at Moorfields, with the diagnosis glioma in twenty-four cases, in seven of which it was wrong. Isler collected the cases of glioma seen at the Basle clinic. In three, operation was refused because the affection was bilateral, and in two an error was made, one case being tuberculosis and the other iridocyclitis with detachment of the retina. In twelve other cases the diagnosis was confirmed histologically.

Goldzieher designated as cylindroma one sort of pseudoglioma. Pinto da Gama found in one case a detachment of the retina with organization of the vitreous when ophthalmoscopically there had been seen a yellow floating tumor. Panas observed in three new-born infants detachment of the retina, due to intra-uterine exudative cyclitis, in which the ophthalmoscopic picture was altogether similar to glioma.

One distinguishes four stages in the development of glioma or neuro-epithelioma of the retina. In regard to the differential diagnosis, only the first two stages need be taken into consideration, for, in fact, it is only in the first stage that the diagnosis may be difficult. When inflammatory signs with increased tension come on, the malignancy is assured.

In the first period—that is, during its intraocular growth—the symptom of the yellow reflex from the interior with complete amaurosis is the chief characteristic, and gave rise to the old name "amaurotic cat's eye." The tint and the hue of the reflex depend upon the transparency of the refractive

media, the size and location of the tumor, and various minor conditions. When the tumor pushes the retina forward before it, the color may be white or bluish-white. When the diagnosis rests upon the ophthalmoscopic examination only, an error is easily possible and only the further observation of the case will reveal its true nature.

The cases which give rise to error can be grouped according to Wintersteiner into two classes.

1. Cryptoglioma, in which an existing tumor cannot be diagnosed on account of accompanying symptoms. Schöbl invented this name and described cases in detail.

2. Pseudogliomas in which inflammatory changes exist in the eye and lead one to suspect glioma.

Tumors are unrecognizable in all cases in which opacity of the cornea, lens, or humors renders illumination of the fundus impossible. In doubtful cases of this sort Blumenthal made an iridectomy in order to see the tumor through the coloboma. Greene, in a similar case, extracted the lens, in order to get an idea of the contents of the eye. A tuberculous tumor of the ciliary body extending into the anterior chamber also may give rise to confusion.

But more frequently other affections of the eye are mistaken for glioma. Among these are detachment of the retina, and sarcoma and tuberculoma of the choroid. Apart from the fact that these diseases are rare in childhood, detachment of the retina has characteristic differentiating symptoms, such as the bluish-gray color of the detached retina, the floating of the membrane, the regular branching of the vessels, and the diminished tension of the ball. The diagnosis of the two other diseases is not difficult.

As pseudoglioma proper, however, we designate that group of cases in which the yellow reflex appears and the eye becomes blind in consequence of chronic inflammation of the choroid or ciliary body. The inflammatory product becomes organized in the vitreous and causes detachment of the retina. In such cases the history is of especial importance.

This disease in the child begins usually but not always with inflammation and pain. The eye is irritated and there is photophobia. The color of the reflex is a metallic yellow. The

exudation contains no vessels, while a tumor is rich in them. The surface of the exudation is smooth, that of the tumor nodular. All this cannot be considered a definite rule since there are many exceptions. The most important point is that the tension in cases of tumor is normal at first and later becomes increased, while in cases of exudation tension is diminished, particularly in the later stages when atrophy and retraction begin. Wetsch considers ectasia of the cornea characteristic of glioma, although this symptom, as well as increased tension, may also be present in plastic and tuberculous inflammations of the choroid, as is sufficiently proved by Brailey's case. Saemisch mentions a case in which the increased tension was caused by detachment of the retina, purulent choroidal inflammation, and connective-tissue degeneration. The presence of synechiæ also indicates inflammation.

These symptoms, however, are sometimes so confusing that the transition stages become unduly prominent and the most skilled diagnostician may find himself at fault.

Purulent inflammation of the vitreous, cysticercus, and opacities of the vitreous that become organized may also lead to wrong diagnoses.

In the following lines I wish to report a case which seems of importance in many respects. Particular interest attaches to the condition of the blinded eye and the ophthalmoscopic picture in the other eye, while the connection of these two pathological states is instructive. Still more interesting is the fact that the most skilful oculists could not make an absolute diagnosis at the beginning of the disease and its true nature was only revealed by further observations.

*August* 13, 1900.—I saw a girl, aged four, whose mother stated that the child squinted with the left eye, was unable to see with it, and for six weeks she had observed at times a yellow reflex from the interior. At the age of six months the child had had an external inflammation of the eye which under a bandage healed in a few days. From the family physician I learned that the child was born at the seventh month, weighing sixteen K, and developed very slowly; at the end of the first year of life marked craniotabes and in the course of the second year rachitis. The child learned to

sit up very late, learned to walk and speak only in the third year, and the psychical development was so slow and incomplete that the child now is an imbecile and the gait still uncertain. Manifest symptoms of hydrocephalus were never present, but the architecture of the skull was similar to that observed in cases of hypertrophia cerebri combined with rachitis. The child had had no particular organic or infectious diseases except an inflammation of the lungs in July, 1901. It may be mentioned as a curious fact that, in eating, the child chewed its food sometimes for a quarter of an hour before swallowing it. Alimentary tract in a healthy condition. The father was diabetic at the time of generation.

The examination of the eyes gave the following results: The right eye recognized at a distance of 4 *m* objects corresponding to the intelligence of the child; the left eye was blind and squinted in. With the child in the right position the yellow reflex from the left eye could be observed at a distance of 2 *m*. With the ophthalmoscope the same reflex was seen, and it was found that the retina was detached and at many points floating. In the upper portion of the fundus atrophic spots as large as the disc were seen partly surrounded by pigmented borders. The eye was free from inflammation, the tension normal. The condition of the other eye was of interest, but here one could gain only an approximate idea of the amount of vision. The entire fundus was filled with atrophic foci of different sizes which involved the choroid as well as the retina. The refractive media were clear in both eyes.

The conditions found in the left eye would have led me to make a positive diagnosis of glioma had it not been for the atrophic patches in the right eye, which suggested a chorio-retinitis in both eyes producing a tumor in the left.

The clinical picture soon changed. Three weeks later the eye began to tear and there was photophobia. Tension increased to + 1, but there was no pain. The pupil had become dilated, but other evidences of glaucoma were wanting. I then began to yield to the opinions expressed by other ophthalmologists and advised the enucleation of the eye. The parents, however, resolved first to consult Professor Fuchs in Vienna, to whom my history of the case was sent. He examined the child in narcosis in October, 1900, and expressed the following opinion: "The yellowish-white patches in both eyes seem to me the beginnings of glioma, particularly since the tension has become increased in the left. The

diagnosis is not, however, absolutely certain. I would advise, therefore, tonic treatment and further observation.

Some weeks later the eye became softer and the ciliary injection disappeared without any therapy. The ophthalmoscopic picture remained approximately the same. The child went through the winter very well, and developed properly. In May, 1901, Professor Fuchs saw the child again and assured the parents that there was no glioma. In July, 1901, I had another opportunity to examine the child. The eye was quiet, the tension normal, the yellow reflex paler, and the tumor atrophied and smaller. The other atrophic portions of the fundus had become paler. The condition of the right eye remained the same except that the yellowish-white patches had become whiter.

This was a case in which the diagnosis was all-important. What have we to guide us in such cases?

Glioma often is bilateral. According to the statistics, both eyes are affected in twenty per cent. of the cases. The tumor may appear simultaneously in both eyes, or the second eye may become involved months or years after the first. The two growths, however, are independent and primary, never metastatic, growths.

When the growth appears in one eye only, the other eye may be lost from changes which are but indirect consequences of the tumor. For example, when the growth extends from one eye to the other, displacing the eyeball or destroying the optic nerve by compression, as in the case described by Midellemore, Glaser observed hemorrhagic neuro-retinitis in the second eye five years after the enucleation of an eyeball containing a glioma. Other authors describe changes which have no relation whatever with the tumor, such as panophthalmitis and scars of the cornea.

A. Graefe stated that glioma developed in the form of white plaques of different sizes scattered over the retina, which differed from infiltrations of the retina in form, opacity, and grouping. They lie sometimes beneath and sometimes above the retinal vessels and early project into the vitreous cavity. Then the retina becomes detached gradually and the tension becomes increased. Most authors—Hirschberg, Schöbl, Perles, Jodko—describe the development

of glioma in the same manner, and all allude to the white color of the plaques, their prominence and location, and the bending of the vessels. To this clinical picture are added detachment of the retina, opacity of the vitreous, and increase in tension.

When we compare the changes in the right eye with these observations, it is at once noticeable that the yellowish-white plaques in the retina were not elevated, that they were often surrounded with pigment, that they did not form groups, but were scattered over the fundus near the disc, that the vessels were not bent in passing over them, and particularly that in the course of a year and a half they did not increase, but, on the contrary, became paler and whiter.

Pigment formation does not occur in glioma. Graefe even maintained that pigment was not found in the cases in which secondary metastatic nodules formed in the choroid, although pigmentation is the chief characteristic of choroidal tumors. Gliomas become colored only through hemorrhage, and then they become brown. Wintersteiner in his monograph cites Hoach's case, in which in the eye free from tumor a number of irregular white patches, surrounded by a pigmented margin, were found about the posterior pole. These at first glance appeared to be patches of choroiditis, but when closely examined they were found to be elevated. Glioma was present in both eyes in this case, and the child died in six months. I have not been able to find in the literature another case of undoubted glioma in which there was pigmentation. The elevation of the patches is of diagnostic importance.

My case was under my observation for a year and a half without further changes taking place in the eye or other organs becoming affected. The spontaneous duration of glioma is known to be a year and a half—rarely more. In the literature there is a single case recorded in which death occurred after twenty-three weeks.

In regard to the length of the first stage, the period before glaucoma develops, there are recorded histories of 81 cases, from which it appears that in 19 cases the first stage lasted one to five years, in 35 cases six months to

one year, and in 27 cases six months. It should be remarked, however, that the first stage lasted two to five years only in cases in which the disease was discovered in the first weeks of life, the condition being congenital. In the great majority of cases the development of glaucomatous symptoms required less than a year.

Hirschberg has operated on 17 cases, and from his own experience concludes that three months after the appearance of the yellow reflex the prognosis of the operation is bad.

These facts also speak against the diagnosis of glioma in my case.

Confusion and errors in the diagnosis of glioma cannot be avoided, and hence I mentioned in the beginning of this paper the conditions found by various writers when the eyeballs were opened.

It is certainly a blunder to enucleate a blind, non-inflamed eye, believing that a tumor was present. Yet such things happen, and even both eyes have been enucleated and found to contain pseudogliomas only (Allin-Delafield).

The diagnosis in my case was difficult, almost impossible. I, myself, believed from the first that the primary condition was a chorio-retinitis, which in the left eye was combined with exudation and partial detachment of the retina. Some cases of this sort have been reported. Schick presented at the meeting of the German Ophthalmological Society in 1900 the histories of two young healthy persons who had prominent masses between the choroid and retina. In one case the mass resembled a glioma, but no change in its appearance occurred in a year and a half. Schick considered them cases of fibrinous exudation.

I was somewhat shaken in my belief by the increase in tension and the views of Professor Fuchs, but the tension soon diminished, and the course of the affection assured me of the correctness of the diagnosis. Whether these changes had any connection with the rachitis I am unable to say, but I have not found any intimations of such a connection in the literature.

In conclusion I wish to call attention to the impossibility

of submitting certain medical questions to general fixed rules; the diagnosis and therapy may often be determined only by a consideration of the particular conditions and symptoms. I recall with pleasure the answer that I heard given to one of his students by the Nestor of French ophthalmologists, Panas: "*Les mots 'jamais' et 'toujours' n'existent pas dans la médecine.*"

# ON PARALYSIS OF LATERO-VERSION.

By Dr. OTTO WERNICKE, Buenos Aires.

Translated from Vol. XLI., 1900, German Edition, by Dr. Ward A. Holden.

IN the past year I had the opportunity of observing a pronounced case of bilateral paralysis of latero-version due to tubercle of the pons and to confirm my diagnosis at the autopsy. The case is reported on account of the rareness of the symptoms and the limited number of similar observations that have been confirmed by autopsy.

J. A., aged thirty, a painter, married, was admitted, June 23, 1899, to Prof. Robert Westphal's department for internal diseases in the Hospital de Clinicas.

The patient could give no information in regard to his parents and the state of their health. He himself has suffered from asthmatic attacks in recent years, which recurred frequently and always lasted several days. In January, 1892, he acquired a chancre, which was followed by swelling of the submaxillary and inguinal glands, an eruption on the skin, mucous patches in the mouth, and alopecia. He had not undergone a thorough course of treatment.

Four months ago he began to have vertigo, which made it difficult for him to walk. He also noticed paræsthesias and marked decrease in the strength of his arms and legs, occasionally accompanied with pain and diminution of vision. The patient attributed these symptoms to the over-use of alcohol and paid no great attention to them. Since, however, they increased even after he had ceased to use alcohol, and a cough with considerable expectoration developed, he presented himself at the hospital.

*St. Pr.*, June 24, 1899. An emaciated man of medium height, white. At various points of the body, scars of wounds which he had received in brawls.

Symptoms of advanced tuberculosis of the lungs, particularly

the right ; tubercle bacilli in the sputum. Heart, liver, and spleen normal. Loss of appetite, and constipation. Epigastrium sensitive to pressure. Retention of urine relieved after repeated catheterization. Amount of urine, 1 litre ; no albumen, no sugar.

The patient could stand upright only with great difficulty. If he closed the eyes, he at once staggered. His gait was that of a drunken man, on account of the marked inco-ordination of the extremities. Lying in bed he could perform any movement desired, but only with uncertainty and after repeated trials. The sensation of pain was moderately diminished on the right side of the body. The patient's statements in regard to thermic and tactile excitations were contradictory. Tendon reflexes increased on both sides.

The patient stated that his vision was poor. Tests with figures gave an acuteness of vision of $\frac{1}{2}$ in each eye. Accommodation preserved. Eyes normal externally, no strabismus, movements of the lids normal. Movements of the eyeballs up and down extensive. Convergence possible to about 6 *cm.* Lateral movements of the eyes completely abolished. When strongly urged, the patient would seem at times to make a slight movement to the right. If one eye is covered, it is not possible for the other eye to follow a moving finger toward its nasal side, but both eyes remain in the middle line. The patient is unaware of the faulty movement of the eyes and compensates for it by turning the head. Both pupils, of normal width, react to light and in accommodation. Refractive media and fundi normal. The patient recognizes the smallest, colored test-objects. There is no gross defect in the field. The patient does not see double even when a colored glass is held before one eye. Olfactorius, trigeminus, and facialis intact. The watch is heard—right at 15 *cm*, left at 40. Rinne positive. Taste preserved, equal on the two sides. No difficulty in speaking or in swallowing.

His psychical condition is somewhat abnormal. On the second day he desired to be discharged, as he could be more comfortable at home. He threatened to throw himself out of the window in case he was not soon discharged. After it was shown that he was quite without means and his wife declared that she was unable to provide for him, he became calm. Even when admitted he was apathetic and his attention soon relaxed. This weakness increased in the following days so that functional examinations, such as the determination of the field of vision, became very difficult.

The condition of the eyes remained constant while he was under observation, but the affection of the lungs gradually grew worse. The psychical condition became duller. July 20th, in the morning, the patient failed to respond when spoken to. Temperature, 37.8°. Anuria. Coma and death at 9 in the evening.

AUTOPSY, July 21st, 9 A.M. There were pleuritic adhesions, chiefly left; bilateral advanced tuberculosis of the lungs (in the left apex a cavity as large as a hen's egg); fatty degeneration of the myocardium, congestion and fatty degeneration of the liver, parenchymatous nephritis, and tuberculous ulcerations in the cæcum and ascending colon.

*Brain.*—Externally normal except for slight dilatation of the superficial veins. Cerebro-spinal fluid in the ventricles rather excessive and cloudy. On palpation, hardening of the brain was found at two spots:

(1) At the upper end of the anterior right central convolution, extending somewhat over upon the inner side of the hemisphere, was a very hard focus as large as a bean, readily felt but scarcely perceptible. Its cut surface was gray; it did not extend into the white substance, and it was not sharply limited.

(2) In the posterior half of the right occipital lobe one could feel particularly from below an irregular hard mass, into which the knife would not pass. It was a calcareous focus in the form of a four-pointed star. Two of the points were directed downward, one anteriorly and a shorter process directly upward. These processes nowhere entered the gray matter.

Besides these two foci, changes were found in the pons. When touched from below, one felt an increased resistance in the pons. Observed from above, the floor of the fourth ventricle appeared quite convex, the greatest elevation corresponding to the region of the nucleus of the 6th nerve. The median furrow had parted over this convexity, forming a shallow cleft 2 *cm* long and 3 *mm* broad, in which the underlying tumor was distinguishable by its red color. Through the floor of the fourth ventricle one felt a round tumor of the form, size, and consistency of an eyeball. The pons and medulla were at once placed in 10 % formol and on the following day divided by a frontal section at the height of the greatest convexity. The cut surface of the tumor appeared nearly round, 2.5 *cm* in diameter, and it lay exactly in the middle line of the pons. It was separated above from the floor of the fourth ventricle by a layer 1.5 *mm* thick of normal-appearing tissue,

while beneath it a layer 6–7 *mm* thick remained. The tumor consisted of a yellowish caseous mass separated from the surrounding nerve tissue by a reddish zone 1 *mm* broad. Both halves were hardened further in formol, then in alcohol, and imbedded in celloidin.

In the sections the caseous mass appeared macroscopically to be composed of concentric rings like a stone in the bladder. It was limited by a villous layer and this again by a zone of small-celled infiltration and greatly dilated vessels. In the cheesy mass no cellular elements were longer to be seen.

The study of serial sections showed that about the level of the 5th nucleus the lesion began to be perceptible through dilatation of the vessels. Near this followed the infiltration and the caseous substance. These changes appeared, first, in the middle line and about 3 *mm* from the floor of the fourth ventricle, but extended more rapidly downward than upward. In sections through the greatest diameter nothing could be seen of the 6th and 7th. On either side one saw the substantia gelatinosa resting on the periphery of the tumor. The descending fibres of the 7th were not visible, but in sections a little farther back were fairly distinct and partially involved in the zone of dilated vessels. Toward the base of the brain the lesion extended in the middle line to the pyramidal tract. Farther toward the medulla the cut surface of the tumor assumed a more obliquely oval form and soon came to lie equidistant from the floor of the ventricle and the lower surface of the pons, gradually growing smaller and at the level of the vagus nucleus being noticeable only through the dilatation of the vessels.

In our case we had a complete paralysis of both pairs of muscles turning the eyes laterally, with the preservation of convergence. The symmetrical position and form of the focus explains the lack of any alteration in the position of the eyes. The focus probably proceeded from the middle line and had caused simultaneous associated deviations of the eyes both to the right and to the left. Thus the eyes under the influence of equally strong but antagonistic forces kept the middle position. This explanation is supported by Bristow's[1] case, in which paralysis of associated

[1] Cited by Wolff, "Lähmung der associirten Seitenbewegungen mit Erhaltung des Convergenzvermögens," *Arch. f. Augenh.*, xxxvi., p. 257, where the literature on the subject may be found.

movement to the right existed with conjugate deviation to the left, but later paralysis of movement to the left came on, so that the eyes stood straight again.

In the several cases of paralysis of the muscles producing latero-version, with preserved convergence, a difference in the mobility of the eyes is noticed, according as the test is made with one eye or with both. Möbius has explained the difference by supposing that the turning in of the eye in uni-ocular tests is to be regarded as a movement of convergence. In my case the mobility of the eye was alike whether one or both eyes were open. And when one eye was covered with a ground glass it was impossible by the most energetic urging to force the patient to turn the exposed eye in, both eyes remaining fixed. Unfortunately the condition of the patient and his inattention prevented me from repeating the experiment frequently under favorable condition in order to confirm the observation of Graefe, who, in a similar case, by long-continued practice, succeeded in obtaining a unilateral movement though a slight one.

The non-involvement of the facial nerve, notwithstanding the intimate relation between their nuclei, has been observed repeatedly. A greater resistance on the part of the nervous elements of the facial nerve has been held to explain the fact, although, as Blocq and Guinon rightly say, this would not really explain it. In my case an explanation is possible. It is not to be doubted that in the last days of the patient's life a more or less complete bilateral facial paralysis might have existed and yet been overlooked in the apathetic patient. The nucleus and the fibres of the facial nerve lay in the most peripheral portion of the focus and thus may partly at least have retained their function; if involved, they were involved later than the fibres of the 6th nerve. If we may also assume that the nucleus of the 6th was not destroyed but only concealed by the infiltration and hyperæmia, still the fibres passing from it must on their way to the base of the brain have been destroyed in the tuberculous focus long before this reached the fibres of the facial nerve.

# REPORTS OF THE MEETINGS OF THE OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

By Mr. C. DEVEREUX MARSHALL.

THURSDAY, OCTOBER 16 AND DECEMBER 11, 1902.

W. ADAMS FROST, F.R.C.S., VICE-PRESIDENT, IN THE CHAIR.

Mr. H. C. Baldwin, in a paper communicated by Mr. Nettleship, recorded a case of **dislocation of the eyeball through the palpebral aperture.** The patient was a woman, who struck the left eye against a projecting gas-bracket. Within fifteen minutes Mr. Baldwin saw her, when the eye was found gouged out and was projecting between the lids. By gentle taxis he was able to reduce it readily. The vision completely recovered, and with the exception of a slightly crinkled appearance at the outer side no visible scar remained.

Mr. Beaumont said he had seen a case of dislocated eyeball in a child, after a difficult delivery; here also the eye was restored to its normal position after twenty-four hours.

Mr. Nettleship recorded a case of **birth-palsy of the sixth and seventh nerves on the same side.** The mother of the patient was thirty years of age, and she had a slightly contracted pelvis. It was a brow presentation and forceps were used, and these left a scar on the head, which was situated on the temporal bone near the ear. There was another scar on the other side, but higher up. The child was born at full term, and showed no sign of asphyxia; there was no swelling of the eyelids. Within a few hours of birth it was noticed that the child squinted inwards with the right eye, the lid remained open, and the facial muscles on the same side were paralyzed.

The right eye could not be turned outwards at all, and the pupil did not react briskly. On the 5th day the condition re-

mained unaltered, and no notice was taken of a noise made near the child's head. A slight hemorrhage was then noticed in the right fundus. Just behind the right ear was a slightly elevated ridge and groove where the forceps had pressed. The condition rapidly improved, and when nine months old nothing abnormal was noticed, except slight weakness of the orbicularis. He can now hear a watch equally well on both sides. Mr. Nettleship thought that the lesion was intracranial, and that the two nerves were affected in their course most likely by hemorrhage, and from the fact that the two nerves recovered at the same time he concluded that the nerve trunks and not the nuclei were the parts which were pressed upon by the blood clot. He did not know of any other recorded case in which these two nerves were involved in a similar lesion.

Mr. FISHER thought that an intradural hemorrhage would have to be very large to affect the nerves in the way described, and he thought a more likely explanation was that the facial nerve was nipped by the forceps as it emerged from the stylo-mastoid foramen, and that the sixth nerve was affected by a hemorrhage from the inferior petrosal sinus.

Mr. NETTLESHIP described a case of **perfect recovery of vision in a case of Leber's disease.** The patient was a tutor, twenty-eight years of age, whose sight failed six months before. The vision was $\frac{6}{60}$ and J 16 in each eye. There was a central scotoma for green, but red could be seen much better. The choroid was dark in appearance and the knee-jerks were brisk. The patient's brother came under Mr. Doyne's care recently for a similar condition, when it was found that the original patient had quite recovered his sight, and had since become ordained and had subsequently become a schoolmaster.

He mentioned another case in which two brothers were affected, and here also one is said to have recovered his sight.

Mr. ADAMS FROST mentioned the case of a man, aged twenty-three, who suffered from the disease, and he informed him that his brother had had the disease, but had partially recovered.

Messrs. ORMOND, JOHNSON, TAYLOR, and LAWFORD all mentioned cases in which improvement had taken place, but in none had recovery taken place to so great an extent as in Mr. Nettleship's case.

Dr. LEDIARD communicated a case of **dermoid cyst of the orbit,** which had dislocated the eyeball and occupied the antrum.

The patient, a man, forty-nine years of age, was admitted to the Cumberland Infirmary in July, 1902. The eyeball had been proptosed for thirty years. The eyeball had been protruding from the orbit and had been blind for five years. A soft doughy tumor was felt above the eyeball and near the outer angle of the orbit, and the eyeball rested on the outer aspect of the malar bone. On removing the globe a dermoid cyst was discovered, which filled the orbit and antrum. The cyst wall could not be removed entirely, but the floor of the antrum was opened so as to facilitate drainage. Dr. Lediard noted the absence of any similar case in the *Transactions*, but drew attention to a case published by Mr. Spencer Watson, in the report of the *Proceedings of the Fourth Ophthalmological Congress*, in 1873.

The following card specimens were shown:

(1) Mr. A. Quarry Silcock. **Detachment of the retina.**

(2) Mr. C. H. Walker. **Embolism of the inferior temporal branch of the retinal artery.**

CLINICAL EVENING, DECEMBER 11, 1902.

WILLIAM LANG, F.R.C.S., SENIOR VICE-PRESIDENT, IN THE CHAIR.

Previous to the commencement of the meeting, Mr. Lang referred in feeling terms to the loss the Society had sustained by the death of the President, Dr. David Little. Subsequently Mr. Lang was elected by the Council to fulfil the duties of the President for the remainder of the session.

Mr. Stephen Mayou showed a case of **contracted pupils undilatable by a mydriatic.** Mr. Sydney Stephenson said that there was in the patient evidence of congenital syphilis with absence of knee-jerks, and he looked upon the case as one of early tabes. The pupils reacted to accommodation but not to light.

Dr. Edridge-Green gave demonstrations of a **classification test for color-blindness,** and also a **lantern for the detection of color-blindness.** The first consisted of colored wools, silks, glass, and cards. It was quite impossible for a person to tell by contrast the different colors unless they were actually able to recognize them. The lantern test consisted of one in which colored glasses, either alone or in combination, could be used.

Mr. Charles Blair and Dr. Bernard Potter showed two cases of **aniridia** and one of **coloboma of the iris** in the same family.

Mr. BLAIR also showed a case of **zonular** or **ribbon-shaped opacity in the cornea.**

Mr. E. E. MADDOX demonstrated an electric eye heater which could be applied in an eye dressing, and which could, by means of a regulating transformer, be heated by the current from the main. He also showed a lamp resistance.

Mr. SYDNEY STEPHENSON exhibited several patients whose corneas had become stained by the long-continued use of **sulphate of copper for trachoma.** The opacity covered the central part of the cornea, and was accentuated towards the upper and lower margin so as to form two crescents of a rusty or greenish color. Pieces removed from the affected cornea by scraping gave some of the characteristic chemical reactions of copper.

Mr. N. C. RIDLEY showed a case of **congenital anophthalmos** and one of **embolism of the central artery of the retina** in a young girl, which followed a severe fright.

Mr. TREACHER COLLINS showed a case of **atrophy of the optic nerves** due to lightning. This was probably due to electrolytic action.

Mr. ARNOLD LAWSON showed a case of **acromegaly** in which there was **bitemporal hemianopia.** He had treated the patient with pituitary gland, and although one eye had improved a good deal, yet the other, which was at first the better of the two, had become a good deal worse. Mr. Doyne had seen no good result arise from the treatment with pituitary gland.

Mr. LAWSON also showed an unusual form of **retino-choroidal change,** the result of **hemorrhage.**

Mr. LANG thought the case extremely suggestive of sarcoma.

Mr. JESSOP showed a case of **optic neuritis with peculiar retinal changes.**

Dr. F. E. BATTEN showed a case of **cerebral degeneration with changes at the macula.**

# REPORT OF THE MEETINGS OF THE OPHTHALMOLOGICAL SECTION OF THE NEW YORK ACADEMY OF MEDICINE, HELD ON MONDAY EVENINGS, DECEMBER 15, 1902, AND JANUARY 19, 1903.

By Dr. HENRY H. TYSON, Secretary.

PRES. DR. JOHN E. WEEKS, IN THE CHAIR.

Dr. Hunter presented a case of **chancre of the eyelid.** Patient, a boy, age sixteen years, was seen twelve days ago, with a shallow dirty-gray ulcer near punctum, lower lid, right eye. No history to account for it. He had enlarged pre-auricular glands, also enlarged cervical glands. He stated that the latter had existed a long time. Mercurial inunctions were prescribed, and the lesion is rapidly clearing up.

DR. KIPP IN THE CHAIR.

Dr. Weeks presented a case of **restoration of the lower lid with skin flap from the arm.** The operation was performed for the relief of cicatricial ectropion. The result was very satisfactory.

Dr. Weeks presented a case of **sympathectomy** performed two weeks ago on left side; an iridectomy had been previously performed on the left eye. Right eye had absolute glaucoma. Vision left eye $\frac{5}{200}$ before sympathectomy operation, increased to $\frac{12}{200}$ after operation; field of vision was somewhat enlarged; tension T + 1. He stated that the operation was somewhat difficult on account of the ganglion being the same size as the nerve-trunk and the small size of the nerve, it resembling a branch of the cervical plexus. He makes his incision about two inches in length.

Dr. Gruening thought that the difficulty encountered was due to the small opening; with a large incision more of the individual

vessels are seen and there is less liability of confusion in recognizing the nerve when exposed to view.

DR. WEEKS IN THE CHAIR.

Dr. C. J. KIPP reported a case of **epithelioma of the ocular conjunctiva, excision, many recurrences, and final cure.** Patient, a woman, age twenty-six years, well developed and apparently in good health, was seen for the first time January 3, 1885, after an attack of the measles. When she was eight years old there appeared a small swelling like a pimple on the white of the eye between the cornea and outer canthus. Six years ago the swelling had attained considerable size and a doctor had attacked the growth with a knife and caustics. The growth reappeared very soon, but remained small and caused no pain or discomfort during the following two years. Since then it has been growing slowly to its present size. When first seen the ocular conjunctiva between the cornea and the outer canthus was the seat of a new growth, somewhat circular in shape and of about 16 *mm* in its greater diameter. It was between 1 and 2 *mm* in height and elevated at the corneal margin. It overlapped the outer fourth of the cornea, but was not adherent to it. It was of a yellowish-red color and of a gelatinous consistency, very vascular, and slightly movable over the sclerotic, otherwise the eye was normal. Vision $\frac{4}{4}$. On January 7, 1885, he made a most thorough excision of the whole growth and covered the wound by suturing the conjunctiva over it. Healed without reaction. On July 27th the eye was examined and no sign of recurrence found. A few weeks later the patient noticed the reappearance of the growth at the sclero-corneal junction, but did not have eye examined again until November 29th, when the growth was found to cover the outer third of cornea to which it was adherent. Growth was again excised and galvano-cautery applied to its base. In June, 1886, eye was again examined and red raised areas were found in three different parts of the periphery of the scar. The galvano-cautery was again applied to each and the eye cleared in about two weeks. On August 26th he found two suspicious-looking places in the periphery of the conjunctival scar and again applied galvano-cautery. On Oct. 2d he found another angry-looking spot in the cicatrix, which was destroyed by the galvano-cautery. During the following three years there was no recurrence of the growth, until May, 1889, when he found a margin of the conjunctival scar again red and raised. Galvano-cautery

was again applied, and he cauterized the tissue for some distance around the inflamed portion. Since then there has been no recurrence. In November, 1902, when last examined, thirteen years after last cauterization, the eye was entirely free from signs of disease and he thought that the case may be regarded as cured. Microscopical section showed it to be an epithelioma of the conjunctiva.

Dr. MARPLE exhibited a **section of the eye with a leucosarcoma,** exhibited clinically at the last meeting.

Dr. GRUENING read a report of a case of **corneo-scleral sarcoma.** Patient, man, age fifty years, who had a small black tumor removed from the outer side of his left cornea, with two operations and two relapses, the side of the wound being cauterized with silver-nitrate stick after the second operation. Patient was examined by Dr. Gruening in February, 1902, and he presented the following appearance: near the outer margin of the cornea, and overlapping it, was a black nodular mass, 9 *mm* in the vertical, 4 *mm* in the transverse diameter, and 3 *mm* in height. The whole of the bulbar conjunctiva and the lower transition fold was diffusely pigmented. A number of flat, circular, reddish bodies, 2 x 4 *mm* in diameter, stood out from the bulbar conjunctiva in marked contrast with the black background. They were situated between the inner edge of the cornea and the semilunar fold and between the lower edge of the cornea and the transition fold. On February 12th the eyeball, with the epibulbar growth, the flat conjunctival bodies, and parts of the pigmented conjunctiva, was excised. The microscopic examination showed that the epibulbar growth consisted of spindle cells and was a melanosarcoma. The flat bodies, consisting of unpigmented spindle cells, were leucosarcomata. The black color of the conjunctiva was due to pigmentation of the otherwise normal conjunctival epithelium. The patient made a good recovery; the wounds cicatrized and he wore an artificial eye eight weeks. In May a leucosarcoma appeared in the conjunctival scar. This was excised. Four weeks later the tumor recurred in the second scar. The orbit was then exenterated; the lachrymal glands, conjunctiva, and tarsus of the upper and lower lids were removed. No recurrence up to the present time.

Dr. WEEKS stated that the extension of these growths was not always confined to the orbital tissues, as he had seen one case where it had extended to the pre-auricular glands.

DR. GRUENING IN THE CHAIR.

Dr. WEEKS read a report of a case of **neoplasm of choroid resembling adenoma,** and exhibited a microscopic specimen of the case. He stated that the patient, a woman, age forty-seven, had consulted him for a severe pain in her head, located in the right temporal region, with also considerable pain in her right eye. Three weeks after the pain commenced she noticed that the vision had almost entirely been lost in the right eye. One week before he examined the eye the vision had been entirely abolished. He made a diagnosis of a tumor in the eye and enucleation was performed. Microscopic examination revealed a structure resembling an adenoma.

Dr. CUTLER read a paper entitled **circumscribed plastic choroiditis with a report of six cases.** He stated that these cases were especially interesting on account of the uncertainty of their etiology. In one case there was a history of probable tuberculosis at an earlier date, and at the time of the onset of the present attack the patient had lost flesh and was in poor general condition. This must, however, be regarded merely as a predisposing factor. The onset of the uveitis two weeks before the first examination was accompanied by sore throat, severe pain in the lumbar region, with frequent passage of dark urine and constipation. In the second case the history of intestinal toxæmia was very clear. In the third the patient showed no signs of general disease at first, but shortly after the development of the choroiditis there appeared a pleurisy with a septic fever and symptoms pointing to a subdiaphragmatic abscess. In the fourth case the attack, accompanied by episcleritis in the opposite eye, sore throat, and pain in the knee joint, suggested an infection resembling rheumatism. In the fifth case the disease began during typhoid fever and recurred in the edge of the same choroidal patch a year later. The sixth case gave no clue whatever to causative factors. These cases were not syphilitic. The choroiditis was circumscribed and benign. Other portions of the uveal tract were not involved, and precipitates on Descemet's membrane occurred in but two cases. The patients were between nineteen and twenty-seven years of age, except one, who was thirty-five when she came under observation, but she had had several previous attacks. Three were women, two men. The prognosis was good in these cases, as the macular regions were not involved. The disease seemed benign

and to be limited by the underlying physical conditions. This was considered the point of most importance in the treatment, and a protest was made against the tendency to treat these cases with any heroic doses of pilocarpin and the salicylates which add to the existing depression. This class, well described by Hill Griffith, seems distinct from the forms of malignant uveitis depicted by de Schweinitz and others, although there are many points in common, and much longer observation will be needed to state whether a line may be drawn or whether the milder form in its relapses passes, as a rule, into the more severe.

Dr. DUANE stated that in these cases it was difficult to locate the site of the lesion as regards the choroid or retina, and that the appearance of a red optic disc with vitreous opacities does not always mean an optic neuritis.

Dr. GRUENING stated that Dr. H. Knapp had described cases of plastic choroiditis thirty years ago, and he was not in favor of calling it Hill Griffith's choroiditis. He thought exudative choroiditis was sufficiently descriptive of the disease.

Dr. H. KNAPP described a case of choroiditis with peculiar features. The patient had lost the sight of one eye with an iridochoroiditis, and complained of flashes of light in the other eye, in which he had had a circumscribed choroidal exudation. The question arose whether he was threatened with a retinal detachment. The examination of the fundus revealed a large patch of choroidal atrophy with excavation of the sclerotic, the retina lining the wall of the excavation.

Dr. WEEKS thought that the etiology in these cases was interesting. He was of the opinion that it was due to some disorder of the blood-vessels and to micro-organisms which circulate in the blood and which were deposited in foci. He thought it was well worth research.

Dr. CUTLER stated that he did not pretend to add anything new or to present any new name for the disease. He simply presented the paper for discussion as to etiology, etc.

MEETING OF MONDAY EVENING, JANUARY 19, 1903.

DR. JOHN E. WEEKS, CHAIRMAN *pro tem.*

At the annual **election of officers** for the ensuing year, **Dr. A. Duane** was **elected Chairman,** and **Dr. H. H. Tyson** was **re-elected Secretary.** On account of the absence of the Chairman, **Dr. Weeks** was elected **Chairman pro tem.**

Dr. WEEKS stated that **the case** he had reported at a previous meeting as **resembling adenoma** of the **choroid,** had **died,** and **cancer** of the **lungs** was observed at the autopsy.

Dr. P. FRIEDENBERG **presented a new color test for testing central vision.** The instrument resembles an ophthalmoscope. The colored discs taking the place of lenses are seen simultaneously by patient and examiner. They are exposed to view by drawing down a shutter, which, on being released, springs back and obscures the color square. This is 4 *mm* square, and by moving a catch can be enlarged to 8 *mm*. The colors are translucent, and can be used by transmitted light. The instrument is portable, simple, and inexpensive. [Will appear in full in the May No. of these ARCHIVES.]

Dr. H. KNAPP thought the test was convenient, and an improvement on present methods.

Dr. CLAIBORNE presented a pair of **trachoma forceps** somewhat similar to the smooth roller forceps, excepting that the rollers have slightly elevated points.

Dr. OATMAN presented **trachoma instruments designed by Dr. Jameson.**

Dr. JAMESON stated that his method was one of superficial grattage.

Dr. CLAIBORNE did not favor the Jameson method on account of the number of operations required. He used Knapp's forceps.

Dr. LAMBERT had used the Jameson instrument on two cases with considerable reaction — more than usual; and also objected to it on account of the number of operations required. The Claiborne forceps he did not think possessed any advantage over the ordinary rollers. He used the Noyes forceps.

Dr. WOOTTAN stated that he used the Noyes and Prince forceps, but he thought the cases on which he had seen the Jameson instrument used had resulted well.

Dr. H. KNAPP stated that the smooth forceps were not new, having, before Prince and Noyes, been used by Himley and others. In treating trachoma the principle was, not to destroy mucous membrane. Cauterizing and cutting away the follicles will cure trachoma but destroy the conjunctiva. The best method was the one that radically removed the granules with the least sacrifice of healthy tissue. This object, so far as he had experience, was best obtained by the roller. The smooth fixed forceps will remove the granulations, but at the expense of a good

deal of conjunctiva. Many roller-forceps were imperfectly made. In some the cylinders were too thin and did not rotate well, in others they were too thick and clumsy. Many failed in having too little play at their pivots. They should be carefully cleansed and sterilized (boiling) immediately after use, and dried by evaporating the water at the pivots and creases by holding the instrument against the hot chimney of an Argand burner. The technique of its use requires delicacy and perseverance; it will have to be learned.

Dr. CALLAN stated that he thought it was not so much the design of the forceps as it was the man who uses them. In operating he scarifies and uses Prince's forceps.

Dr. WEEKS stated that in trachoma, where the follicles are discrete, he believes in superficial scarification, and uses Noyes's forceps.

Dr. MARPLE stated that he believes that scarification gives better results than without it.

Dr. JAMESON stated that in the follicular trachoma two or three operations with his instruments were sufficient. In some other cases it required a number of operations. He misunderstood the inquiry when he stated that it required fifty operations to cure trachoma with his method.

Dr. LAMBERT inquired whether any one had used formalin after trachoma operations. He had heard of it being used in 1:2000 solution after such cases.

Dr. TYSON stated that he had not used it after trachoma operations, but had used it in acute epidemic conjunctivitis and ophthalmia neonatorum in 1:5000 and 1:10,000 solutions, and had obtained some excellent results. He found that solutions made by druggists in general were unreliable and the results varied accordingly. In some cases decided smarting and discomfort would follow its use at home, while the solution properly made and used in his office would not act unpleasantly. In some cases of blennorrhœa it acted rapidly and with marvellous effect, while in other cases it apparently failed to exert any influence. The solution was very unstable and lost its strength rapidly; it should be kept tightly corked.

Dr. WEEKS stated he had used it in corneal diseases—*e. g.*, keratitis dentritica in 1:2000 solution, but thought it produced a congestion of the iris resembling a subacute iritis.

Dr. FRIEDENBERG presented a **color-test lamp.**

The lamp is composed of asbestos chimneys to be used over an Argand burner or electric bulb. There are three discs: disc No. 1 contains white, green, red, blue, purple, yellow, as used for signals on the N. Y. C. & H. R. R. R.; No. 2, ground glass and London smoked glass to give effect, respectively, of mist and fog; No. 3, apertures from 1 *mm* to 25 *mm* in diameters. The test-distance for 1 *mm* aperture and low flame is three inches. A movable shutter swings past the apertures and exposes the lights momentarily or for as long a period as is desired.

Dr. LAMBERT stated that he uses Dr. W. Thomson's lamp which is almost exactly similar to the lamp shown by Dr. Friedenberg. He had found this test confirmed the wool test, but had not detected any defect not shown by the wool test.

Dr. SCHAPRINGER reported a case of **traumatic cataract produced by the breaking of a catgut violin string,** one end of which struck the eye. The patient had a slight superficial corneal opacity, two posterior synechiæ, and an opacity of the lens in the upper-outer quadrant. Vision was considerably reduced considering the transparency of the rest of the lens. Counts fingers at a few feet. The question was whether to extract it or to leave it alone. Vision had not changed much, if any, of late.

Dr. H. KNAPP advised leaving it alone, as he saw nothing to be gained by an operation.

DR. H. KNAPP IN THE CHAIR.

Dr. WEEKS reported a case of **panophthalmitis from infection with the micro-organism lanceolatus, without a perforating wound of the eyeball.** W. S., aged seventeen years, was admitted to the New York Eye and Ear Infirmary on November 29, 1902, complaining of pain and loss of vision. The symptoms had appeared three days previously. Vision in the right eye was nil; the ocular and palpebral conjunctivæ were slightly congested; lachrymation was profuse; the eyeball was enlarged, the cornea clear, the anterior chamber more shallow than normal, the pupil of moderate size, the iris of a yellowish tone, the lens transparent, and a yellowish reflex, which was uniform throughout the pupillary area, was present. The patient complained of pain in the side of the head corresponding with the affected eye. Hot bathing and atropine locally, and small, frequently repeated doses of calomel internally, were ordered. Temperature 99.5° F. On

December 5th the temperature reached 100° F.; there was considerable chemosis, the anterior chamber was filled with yellow exudate. As it was impossible to save the eyeball, exenteration was done on December 6th, the cavity of the emptied sclera being washed out with hot bichloride (1:2000), and packed with iodoform gauze, and a light bandage applied. Pain and temperature subsided at once. The packing was changed every forty-eight hours until the end of the tenth day, at which time granulation tissue appeared.

Bacteriological examination showed that the pus which filled the posterior chamber contained the micrococcus lanceolatus in pure culture. Inoculation of tubes of blood-serum resulted in growths of this micro-organism. Inoculation of the anterior chamber of a rabbit's eye also produced a pure culture and caused a hypopyon keratitis with marked congestion of the conjunctiva. Inoculation of tubes with the hypopyon pus produced the same micro-organisms. There was an indefinite history of a blow upon the eye, but close inspection failed to reveal the slightest abrasion, nor was there any disease of the nasal passages, naso-pharynx, no pneumonia, nor grippe. The case was evidently one of infection from within, the focus from which the micro-organisms were derived being undiscoverable; the vitality of the tissues had probably been reduced by a slight contusion. The case shows the possibility of the entrance of micro-organisms into the circulation through lesions too small to be seen.

Dr. H. KNAPP thought that there could be only two ways of explaining the presence of the micrococcus within the eye, either by auto-infection—*i. e.*, metastasis, or through some undiscovered local entrance, as brain abscesses have been found to result from insignificant, unheeded injuries of the skull.

# SYSTEMATIC REPORT ON THE PROGRESS OF OPHTHALMOLOGY IN THE FIRST QUARTER OF THE YEAR 1902.

By Dr. G. Abelsdorff, in Berlin; Prof. ST. Bernheimer, in Innsbruck; Dr. O. Brecht, Prof. R. Greeff, Prof. C. Horstmann, and Dr. R. Schweigger, in Berlin;

with the assistance of

Dr. A. Alling, New Haven; Prof. E. Berger, Paris; Dr. Dalén, Stockholm; Dr. J. Herrnheiser, Prague; Prof. Hirschmann, Charcow; Dr. J. Jitta, Amsterdam; Dr. Krahnstöver, Rome; Mr. C. Devereux Marshall, London; Dr. P. von Mittelstädt, Metz; Prof. Da Gama Pinto, Lisbon; and others.

Translated by Dr. Ward A. Holden.

*(Continued from page 90.)*

## Sections XV.–XVIII. Reviewed by Dr. O. BRECHT.

### XV.—CHOROID.

140. **Fuchs.** Detachment of the choroid after operation. *Graefe's Archiv*, liii., p. 375.

141. **Bietti.** On detachment of the choroid after cataract operation. *Ann. di Ottalm.*, xxx., pp. 10, 11.

142. **Berl.** A contribution to the pathology of sarcoma of the choroid. *Beiträge z. Augenheilk.*, xlix., 67.

143. **Tashiro.** On the structure and pigmentation of choroidal sarcomas. *Inaug. Dissert.*, Halle, 1902.

144. **Bull, C. S.** Metastatic choroiditis occurring in the course of pneumonia, based on the study of six cases with two autopsies. *Trans. Amer. Ophth. Soc.*, 1901, abstract published in these Archives, vol. xxx., p. 427.

145. **Kipp.** A case of sarcoma of the choroid, followed by phthisis bulbi, and twenty years later by perforation of the anterior part of the globe and rapid growth of the neoplasm. *Ibid.*, 1901.

Fuchs (140) reports new cases of detachment of the choroid after operation. All cases of extraction and iridectomy performed in a period of ten months and a half were carefully examined in this regard if they presented any suspicious signs. Cases are suspicious when the restored anterior chamber becomes shallow again, or is obliterated, or is not fully restored after operation. The statistics given contain only unquestionable cases. The first series contained extractions done with the Graefe knife. The author found in 318 extractions with iridectomy, 14 detachments = 4.4 %; in 175 without iridectomy, 9 detachments = 5.1 %; altogether, in 493 extractions, 23 detachments = 4.7 %.

In these 23 cases with detachment, the course was uncomplicated in 17, and complicated in 6, or 26 %. Possibly the detachment occurs more frequently in complicated cases than in those that heal smoothly, since the number of complicated cases does not reach ¼ of the total number of extractions.

The second series contained detachments after iridectomy. They were found 11 times in primary glaucoma, twice in secondary glaucoma, once in chronic iritis; 14 times in all. Among the 111 operated glaucomatous eyes there were detachments in 11, or 10 %, as against 4.7 % after cataract operation. To these 37 cases are added 9 which the author reported in his first paper (*Graefe's Archiv*, li., p. 199, 1900), 11 which were cited from the literature in that paper, and 3 cases reported by Augstein (*Zeitschr. f. Augenh.*, v., p. 268). The reason for the frequency of detachment after extraction and iridectomy for glaucoma lies in the rigidity of the sclera in advanced age, or in the nature of the section with the Graefe knife, or in the increased tension in glaucoma. Most of the detachments are noticed from two to eight days after the operation. The diagnostic signs are circumscribed prominence of the fundus without detachment of the retina, and, in pronounced cases, a dark, curved line at the posterior border of the elevation. Limited detachments are easily overlooked. Their size usually remains constant and rarely increases. The detachments disappear usually slowly, but sometimes quickly. They last from one day to a month, but usually their duration is about two days. The prognosis is good. In 9 eyes from which cataracts had been successfully extracted and death supervened, permitting anatomical examination, detachment was found four times. In all four the conditions were the same: serous liquid among the separated lamellæ of the suprachoroides, rupture of

the delicate tissues of the chamber angle, and absence of detachment of the retina.

Differing from this group of detachments are three other groups. In Group 2 there is traction upon the retina and choroid from the traction of inflammatory membranes, with transuded serum beneath the choroid. In Group 3 a rupture of a choroidal vessel produces a collection of blood beneath the choroid, and in Group 4 there is an inflammatory exudation. The four groups are differentiated by the outcome. In Group 1 restitutio ad integrum is possible, in Group 2 the detachment persists, and in 3 and 4 a partial restoration of normal conditions is possible.

BIETTI (141) observed two cases of detachment of the choroid after cataract extraction. He calls attention to the fact that of the 25 cases reported 20 followed extraction with iridectomy, 4 followed simple iridectomy, and 1 sclerotomy. Traction in the iris may readily cause a tearing of the ciliary body, allowing a filtration of aqueous humor into the suprachoroidal space.

In his second case an iridodialysis was produced at the operation, and the author believes that a temporary injury of the ciliary body may be assumed as the cause of the detachment in the other case.

BERL'S (142) case of choroidal sarcoma which was largely necrotic was peculiar in that, besides inflammation in the uveal tract, retina, and optic nerve, there was extensive œdema of the conjunctiva and scleritis. The sclera at the site of the tumor was increased to three times its normal thickness and infiltrated with cells. The episcleral tissue was swollen and loosened. Microorganisms were not found. The author regards the necrosis of the tumor as the cause of the inflammation.

TASHIRO (143) sums up the results of his work as follows:

1. The polymorphous cells composing melanosarcoma are of the same origin. The differences in shape depend partly upon the irregularities in the shape of the chromatophores from which the cells spring, partly upon the rapid production of cells which have not reached their full development, and partly from the hypertrophy and breaking down of the cells.

2. The unpigmented cells in a melanosarcoma are quite similar elements. In the case of these cells the proliferation is too rapid to allow the formation of pigment.

3. The pigment cells produce their pigment in a metabolic

manner by their protoplasm being gradually transformed into melanin. The hæmoglobin is here only an oxygen carrier.

4. The retinal epithelium takes no part in the structure of melanosarcoma, but it may proliferate harmlessly in cases of sarcoma of the choroid.

5. Melanosarcoma is composed of a specific variety of cells which arise from chromatophores, a sort of connective tissue, and are characterized by their irregular shape and the production of melanin. Just as carcinoma arising from goblet cells becomes carcinoma mucosum, a special variety, so melanosarcoma is a special variety. Ribbert suggests the name chromatophoroma for the true cases in order to distinguish them from sarcomas that are accidentally pigmented.

## XVI.—VITREOUS.

146. **van Duyse.** One manner of termination of the hyaloid artery. *Bull. de la soc. belge d'opht.*, Nov. 24, 1902.

147. **Marple.** A contribution to the pathology of vascular growths into the vitreous. *Trans. Amer. Ophth. Soc.*, 1901.

148. **Koller.** Cyst of the vitreous. *Ibid.*, abstract in these ARCHIVES, vol. xxx., p. 672.

In VAN DUYSE'S (146) case, a persistent hyaloid artery broke up at the infero-temporal portion of the posterior pole of the lens, where it passed over into a number of radiating filamentous opacities. BERGER.

MARPLE (147) presents the case of a lady of fifty, who showed an interlacing system of blood-vessels coming forward into the vitreous from the upper, lower, and nasal borders of the disc. There was no other complication in the fundus. When observed again two months later, a grayish mass covered with blood-vessels was seen in the vitreous by oblique illumination, appearing exactly like a detached retina. In view of the possibility of malignant development, the eye was enucleated. The macroscopic examination showed a non-vascular mass of connective tissue attached to the papilla in the posterior part with a vascular membrane in front, the latter separating anteriorly about 4 *mm* back of the lens and radiating toward the ora serrata, where it joined the retina. Under the microscope the optic-nerve fibres were seen to proceed directly forward from the papilla into the vitreous with numerous small blood-vessels among them. Interest centres in the fact that of 14 cases of formation of vascular new

growths in the vitreous only the present case and one other were first observed at a time when there were no apparent retinitis or hemorrhages present. The author believes the origin to have been a hemorrhage under the membrana limitans interna bursting through into the vitreous over the papilla, with subsequent vascularization of the coagulum. The case is a typical retinitis proliferans. ALLING.

## XVII.—GLAUCOMA.

149. **Panas.** Pathogenesis and treatment of glaucoma. *Arch. d'opht.*, xxii., 2, p. 69.

150. **Altland.** Extirpation of the superior cervical ganglion in glaucoma. *Klin. Monatsbl. f. Augenheilk.*, xl., p. 140.

151. **Fabris.** Bilateral cervical sympathectomy for glaucoma. *Gaz. d. osped. e. d. clin.*, 1901, No. 36.

152. **de Schweinitz.** Concerning the treatment of the apparently unaffected, or at least but slightly involved, eye in cases of monolateral glaucoma. *Trans. Amer. Ophth. Soc.*, 1901.

According to PANAS (149), apart from iridectomy in acute glaucoma, the only essential of all the operations for the different forms of glaucoma is the relaxation of the sclera by means of a section as near as possible to the angle of the iris and Schlemm's canal. Panas made a sclerotomy behind the plane of the iris in two cases of acute hemorrhagic glaucoma, and in eight cases of absolute chronic glaucoma, with good result in the two acute cases and in one of the others. In the successful cases there seemed to be a great collection of liquid in the posterior chamber (œdema of the vitreous or suprachoroidal space).

When iridectomy has no effect, Panas does not repeat the operation but cuts through the scar. Iridosclerotomy, which combines sclerotomy with a peripheric iritomy, is useful in cases of leucoma adherens, with or without staphyloma, and in glaucoma with obliteration of the anterior chamber, if a considerable amount of liquid is evacuated.

In simple chronic glaucoma with slight periodic blurring of vision, with or without cloudiness of the cornea and dilatation of the pupil, a broad iridectomy is indicated. Enucleation should be replaced by keratectomy—removal of the cornea, iris, and lens, with the introduction of a suture. This always gives good results.

In conclusion, Panas recommends again oily solutions of eserine, which can be preserved longer, are better borne, and have a more

intense action than the aqueous solutions. Once he cured with an oily solution an acute glaucoma, and in cases of simple inflammatory and infantile glaucoma he obtains a cure or a considerable improvement. V. MITTELSTÄDT.

ALTLAND (150) reports a case of glaucoma simplex which has remained free from attack for seven months after extirpation of the ganglion, while previously there were exacerbations every second day.

DE SCHWEINITZ'S (152) conclusions are as follows: 1. In cases of acute glaucoma, the apparently unaffected eye should be operated upon as soon as the wound in the opposite eye is closed, provided any indications of involvement are present; in absence of signs, a preventive iridectomy is justifiable. 2. In chronic congestive glaucoma, the same advice applies. 3. In chronic simple glaucoma, if any periods of increased tension, however temporary, can be demonstrated, operation (the author favors iridectomy) should be performed even if the central and peripheral vision are intact. ALLING.

## XVIII.—SYMPATHETIC OPHTHALMIA.

153. **Terrien.** The sympathetic affections of the eye. *Gaz. des hôpitaux*, 1901, No. 144.

## Sections XIX.–XXII. Reviewed by PROF. GREEFF, Berlin.

## XIX.—RETINA AND FUNCTIONAL DISTURBANCES.

154. **Hoffmann.** A contribution to the knowledge of vascular changes in the eye in chronic nephritis, from the microscopic examination of the eyes of a patient with the typical picture of embolism of the central artery. *Arch. f. Augenheilk.*, xliv., p. 339.

155. **Druault.** Researches on quinine amaurosis. *Arch. d'opht.*, xxii., 2, p. 93.

156. **Vries.** Endarteritis of the central artery of the retina. *Med. Tydschr. v. Geneesk.*, 1902, 1, No. 7.

157. **van Duyse.** Simultaneous embolism of the central artery in the two eyes. *Bull. d. l. soc. belge d'opht.*, Nov. 24, 1901.

158. **Rosenberg.** On the pathogenesis of toxic neuroretinitis. *Wjest. Ophth.*, Jan.–Feb., 1902.

159. **Tichomiroff.** A case in which a subretinal extravasation was quickly absorbed under the influence of blue rays. *Ibid.*

160. **Leplat.** Arterio-venous aneurysm of the retina. *Bull. d. l. soc. belge d'opht.*, Nov. 24, 1901.

161. **Chevallereux.** Traumatic rupture of the retina. *Bull. d. l. soc. d'opht. de Paris*, Feb. 4, 1902.

162. **Jones, E. Harris.** The relation of glaucoma to thrombosis of the retinal veins. *Brit. Med. Jour.*, Jan. 18, 1902.

163. **Hahn** and **Knaggs.** Detachment of retina during labor. *Lancet*, May 18, 1901.

164. **Snell, Simeon.** Sun-blindness of the retina. *Brit. Med. Jour.*, Jan. 18, 1902.

165. **Würdemann.** Blindness from inhalation and ingestion of methyl alcohol. *Amer. Med.*, Dec. 21, 1901.

166. **de Schweinitz** and **Shumway.** Histological description of an eyeball with dropsical degeneration of the rod and cone visual cells of the retina, which clinically simulated glioma. *Trans. Amer. Ophth. Soc.*, 1901.

167. **Heath, F. C.** Amblyopia from carbon bisulphide poisoning. *Annals of Ophth.*, Jan., 1902.

168. **Murakami.** A contribution to the pathological anatomy of chorioretinitis disseminata, with remarks on inflammatory formation of rosettes of the neuro-epithelial layer, spontaneous formation of perforation in the macula, etc.

Hoffmann (154) describes a case showing that albuminuric retinitis caused by arterio-sclerosis of the central artery may exactly resemble in its clinical aspects embolism of the artery. Most of the recent writers consider the other symptoms of albuminuric retinitis secondary to the vascular changes. Hoffmann's case is a fine example to support Michel's view that retinitis albuminurica is only the expression of circulatory disturbances and tissue lesions caused by a primary disease of the vessel walls in the form of an arterio- or thrombo-phlebitis of the central vessels.

Druault (155), after experimenting on dogs, comes to the conclusion that the degeneration of the multipolar ganglion cells of the retina in quinine amaurosis is due to the immediate effect of the quinine upon these cells and not to disturbance of circulation. The latter, which manifests itself in pallor of the disc and constriction of the vessels six to seven hours after the subcutaneous injection of an almost lethal dose of quinine, is mostly so slight that it can hardly be the cause of the cellular degeneration that begins at that time. Furthermore, it passes off in twenty-four hours to return in four or five days and increase up to the twentieth or thirtieth day. This secondary anæmia is not the cause but the result of the already existing destruction of the ganglion cells of the retina. Only the cells in the middle of the retina, differing in structure from the others, remain unchanged, which is not in accord with the idea that the anæmia is the actual cause of the degeneration.

In quite young dogs whose ganglion cells are not fully developed, and when the cells have undergone changes following

section of the nerve, the quinine changes do not occur, as the author showed in a paper in the *Arch. d'opht.*, 1900.

v. MITTELSTÄDT.

In the case reported by VAN DUYSE (157) a man of seventy-one in good health, except for atheroma of the heart and vessels, suddenly became blind in the left eye and a few minutes later in the right, with the typical picture of embolism of the central artery in both eyes. Later there was poor circulation in the veins.

The writer excluded every other cause of blindness except embolism. In other similar cases vision has returned in one eye, but in this case both eyes remained blind. v. MITTELSTÄDT.

ROSENBERG (158) injected the toxin of typhoid fever into the subarachnoid space in rabbits and found that a basilar inflammation was set up with œdema of the retina, interstitial and parenchymatous disturbances in the nerve, and even sometimes a well-marked choked disc. The pupil remained large and sluggishly responsive to light for a month or two, and there was frequently nystagmus and sometimes transient exophthalmus.

JONES (162) publishes four cases in which glaucoma followed unilateral thrombosis of the retinal vein associated with arteriosclerosis but without albuminuric retinitis.

The oldest patient was sixty-six years, and the age of the other three was fifty-nine. In three of them acute glaucoma came on six weeks after the thrombosis, and in one chronic glaucoma did not come on for nine months. In two of the cases both eyes were affected with glaucoma, although only one had thrombosis of its retinal vein.

In some there were hemorrhages on the surface as well as into the substance of the iris, showing that the ciliary arteries were also affected. This is a strong contra-indication to the performance of iridectomy. The prognosis in simple thrombosis is not so bad unless acute glaucoma supervenes, and if it does, this is most serious, since iridectomy does not afford much chance of success.

MARSHALL.

HAHN and KNAGGS's (163) patient, aged twenty-one, when first seen had been in labor for twenty-four hours. For three weeks the face, legs, and hands had been œdematous. She was now semi-conscious and quite blind, this having suddenly developed. Labor was terminated, but for thirty hours there was no excretion

of urine. The ophthalmoscope showed that the lower third of each retina was detached.

Her general condition began to improve, and in less than a month afterwards no detachment was visible. Shortly after, the vision had gone up, and there was only a slight loss of the upper part of the fields.

The authors attribute it to the general anasarca, and consider that temporary detachment of the retina is more frequent than is apt to be supposed. MARSHALL.

SNELL's (164) patient, whose case is here reported, was a man aged forty, who at intervals was looking at the sun in eclipse on May 29, 1900, for about an hour; part of the time he used a blue glass and part of the time a ruby glass and occasionally he used nothing at all.

An hour or two later direct vision was blurred, and the same evening he found it impossible to read a newspaper on account of a hazy blankness of a circular shape with an indistinct outline. At first it appeared to be about the size of a penny but it soon got smaller. The direct vision was found to be $\frac{6}{24}$, and indirect vision $\frac{6}{6}$. There was slight haziness around the papilla and the veins were very full. The central blur became fainter and on June 8 the direct vision of both eyes was $\frac{6}{6}$. On July 5 it was $\frac{6}{6}$.

A small disc was seen on everything that was looked at, but this became smaller and smaller and finally disappeared. The patient is now quite well and there are no ophthalmoscopic changes visible.

The interest of the case lies in the fact that both eyes were affected and both recovered, leaving no ophthalmoscopic change behind. MARSHALL.

DE SCHWEINITZ and SHUMWAY (166) report a case which showed a series of cyst-like spaces, situated in the external nuclear layer which was itself absent. The cavities were bounded laterally by the thickened fibres of Müller and externally by the external limiting membrane. They were crossed by a fine reticulum of large flat cells. After excluding other explanations, the authors conclude that the condition is a dropsical degeneration of the nuclei and surrounding protoplasm of the visual cells.

ALLING.

HEATH (167) observed the case of a girl who worked two months in a rubber factory and had shown symptoms of irritability, mental impairment, muscular weakness, and dimness of vision. After one

year the vision was $\frac{1}{10}^{5}$. The ophthalmoscope showed only pallor of the optic discs. There was no central scotoma, but the field of vision was contracted, especially for colors. The amblyopia was accredited to the use of carbon bisulphide during the time she worked at the rubber. ALLING.

MURAKAMI (168) made a microscopic examination of a case of hole in the retina at the macula after syphilitic chorio-retinitis. In the macular region he found œdema in the form of a system of cavities in the inner nuclear and outer reticular layers. At the periphery of the altered area the inner nuclear layer was split into two layers, forming a cyst. The deeper layers of the retina had almost entirely disappeared.

About the centre of this area, corresponding to the macula, the anterior wall of the cyst was wanting for $\frac{3}{4}$ *mm.* There was here a hole in the retina with undermined margins communicating directly with the vitreous chamber.

## XX.—OPTIC NERVE.

169. **Siegrist.** On little known forms of disease of the optic nerves. *Arch. f. Augenheilk.*, xliv. Ergänzungsheft.

170. **v. Michel.** On bacterial emboli in the optic nerve. *Zeitschr. f. Augenheilk.*, vii., 1.

171. **Rosenbaum.** A contribution to aplasia of the optic nerve. *Ibid.*, 3.

172. **Sulzer.** Compression and atrophy of the optic nerves in a case of generalized molluscum (von Recklinghausen's disease). *Bull. d. l. soc. d'opht. de Paris*, Jan. 7, 1902.

V. MICHEL'S (170) patient, a man of forty-five, had pyæmia after an injury to the nose. Clinically a diagnosis of metastatic iridocyclitis was made.

At the autopsy there were found endocarditis and multiple embolic foci of softening in the brain. The microscopic examination revealed unexpected metastatic foci in the posterior portion of the optic nerve. Streptococcus emboli were found not only in the vessels of the major vascular circle of the iris, whence the inflammation in the anterior segment of the ball, but also in the central artery of the retina. There were three foci in the optic nerve, the largest in the dural sheath, the two smaller in the nerve trunk.

ROSENBAUM (171) collected the cases of aplasia of the nerve in the literature and added new ones. In rare cases, in congenital malformations, particularly anencephaly and hydrocephaly, the optic nerve may be entirely wanting. In anencephaly the cells of the ganglion-cell layer of the retina are usually wanting, as are also

the nerve fibres of the retina and nerve (Manz, Carafi, Ritter, Hegler, v. Leonowa, Rosenbaum).

Seiler described the microscopic condition of the eyes in hydrocephaly. The optic nerve and retina were wanting, but the eyes were otherwise well formed. Rosenbaum describes two similar cases. In both the optic nerve seemed to be present, but microscopically it was found to consist of tough connective tissue with no nerve fibres. Only vessels and a small amount of glia tissue passed from the papilla to the retina. The lack of nervous elements in the anencephalic is attributed to a systemic defect, *i. e.*, in the germ plasm the proton of the neuron is absent (Petrén, Rosenbaum).

Dötsch described a case of microphthalmus in man in which the optic nerve was represented by a thin tract of connective tissue. There were no nerve fibres in it or in the retina.

Van Duyse examined a cyclopic eye in which no nerve was present.

Rosenbaum found a lack of optic nerve and disc in a grown rabbit. He believes the lack of development of the nerve is of retinal origin. Possibly this defect depends upon the absence of the retinal vascular system which nourishes the ganglion cells and nerve fibres.

Aplasia of the nerve may arise from developmental anomalies that are cerebral, as well as from such as exist in the eye alone or in the surrounding parts.

## XXI.—INJURIES, FOREIGN BODIES, PARASITES.

173. **Staever.** Subconjunctival perforation of the sclera from an arrow injury. *Zeitschr. f. Augenheilk.*, vii., 3.

174. **Panas.** Injuries of the eyeball and orbit from firearms. *Arch. d' opht.*, xxii., 3, p. 133.

175. **Volkmann.** The theory of eye magnets. *Klin. Monatsbl. f. Augenheilk.*, Jan., 1902.

176. **Cramer.** A further contribution to the clinical aspects of iron splinters in the eye. *Zeitschr. f. Augenheilk.*, vii., 2.

177. **Nuel.** Paralysis of the external oculomotor nerve as the sole symptom of a traumatic rupture of the internal carotid in the cavernous sinus. *Bull. d. l. soc. belge d'opht.*, Nov. 24, 1901.

178. **Bocchi.** Extraction of a subretinal cysticercus. *Ann. di Ottalm.*, xxx., 8–9.

179. **St. John.** Large foreign body in the anterior chamber removed with preservation of perfect vision, with photograph of foreign body in situ. *Trans. Amer. Ophth. Soc.*, 1901.

180. **Hubbell.** A case of foreign body lodged within the eyeball and

removed eighteen years after the injury. Sympathetic inflammation three times without loss of vision. *Ibid.*

181. **Sweet.** Result of X-ray diagnosis and of operation in injuries from foreign bodies. *Ibid.*

182. **Fox, L. Webster.** A new localizer for determining the position of foreign bodies in the eye by the Roentgen rays. *Phil. Med. Journ.*, Feb. 1, 1902.

PANAS (174) describes shot injuries of the eye and orbit as seen by him and as reported in the literature. In the first portion of the paper he discusses injuries with small shot. In these cases conservative treatment is indicated. Even when the foreign body is in the eye enucleation need not always be done, because the foreign body will often be borne without sympathetic ophthalmia arising. Furthermore, it is often difficult to say whether the shot is in the eyeball or in the orbit. He recommends that the eyeball be moved while exposed to the X-rays in order to determine whether the shadow of the foreign body moves or remains fixed.

In the second portion of the paper he treats of revolver shots of the orbit which usually are produced by would-be suicides. The prognosis in these cases is grave. The ophthalmoscopic picture differs according as the ball has struck the optic nerve before or behind the entrance of the vessels. Anosmia is rare, but it is found in injuries at the level of the lamina cribrosa. Revolver bullets in the orbit may cause phlegmon or sympathetic inflammation years after the injury. In a case of phlegmon Panas found in the enucleated eye the bullet from a *chassepot* which had been in the eye fifteen years. It is advisable when it can readily be done to remove bullets early.

In the third portion of his paper, Panas reports three cases of shot wounds in the mouth, in the orbit, and in the ear. In the first case there was paralysis of the fifth and seventh nerves with lagophthalmus and neuroparalytic keratitis, and in the third case with marked lagophthalmus the cornea was intact. Panas believes that the corneal affection is not due to the lack of function of the Gasserian ganglion, but to a state of excitation of the fifth nerve.

In the treatment of these injuries the main point is to prevent primary or secondary infection. V. MITTELSTADT.

CRAMER (176) removed an iron splinter from a patient's eye. It was supposed that another splinter remained in the eye. After a time there was acute lessening of tension, and months later typi-

cal glaucomatous attacks. The lens was removed and later an iridectomy done, after which the eye became quiet. The iris assumed a rust color, and the diminished vision suggested a beginning degeneration of the retina from the presence of iron in the eye.

Two cases: 1. Perforating wound of the cornea, traumatic cataract, iron splinter in the posterior chamber, iridectomy, extraction of the splinter. Extraction of cataract, sympathetic inflammation of the second eye, enucleation of the first, cure of the sympathetic ophthalmia. 2. Perforating wound of the cornea, traumatic cataract, iron splinter in the lens. Removal of the splinter and extraction of the cataract with good result.

The magnet which was at hand was not used in either case.

In NUEL'S (177) case the patient was struck at the inner canthus with the point of an umbrella. At first he was unconscious, then followed vertigo, severe headache, swelling of the lids, and a slight convergent strabismus. Three weeks after the injury there was only a paralysis of the external rectus. Nuel assumed an intraorbital or intracranial lesion of the sixth nerve. Three months later the patient died after an apoplectic attack. At the autopsy it was found that the internal carotid had been torn within the cavernous sinus and the only result of this injury was an atrophy of the sixth nerve. The sudden death was due to hemorrhage into the ventricles. BERGER.

BOCCHI (178) after incising the sclera and choroid removed a cysticercus with preservation of the ball. The sclera and conjunctiva were closed with the same sutures, the knots lying upon the conjunctiva. KRAHNSTÖVER.

SWEET (181) presents a table of sixty-five cases in which the X-ray showed a foreign body in or near the eyeball. So far as the findings in these cases could be verified by extraction of the foreign body or after enucleation, the substance was in every instance situated at the spot indicated by the radiograph.

ALLING.

FOX (182) has devised an instrument in the form of an oval band of gold or silver so shaped as to conform to the outline of the eye, and provided with two strands crossing in front at right angles, thus dividing the instrument into quadrants. This skeleton hemisphere is fitted over the anterior portion of the eyeball under cocaine and serves the purpose of localizing a foreign body. A number of skiagraphs accompany the article. ALLING.

## XXII.—OCULAR DISTURBANCES IN GENERAL DISEASES.

183. **Sidler-Huguenin.** On hereditary syphilitic changes in the fundus, with general remarks on eye affections in hereditary syphilis. *Habilitationsschrift*, Hamburg and Leipsic, J. Voss, 1902.

184. **Senn, A.** Retino-chorioiditis rudimentaris e lue congenita. *Arch. f. Augenheilk.*, xliv., Ergänzungsheft.

185. **Greeff.** On the "tubular visual field," in hysteria. *Berl. klin. Wochenschr.*, 1902, No. 21.

186. **Jocqs.** On ophthalmoplegia in syphilis. *Bull. d. l. soc. d' opht. de Paris*, Dec. 3, 1901.

187. **Nathanzon.** Ophthalmia metastatica septico-pyæmica. St. Petersburg, 1902, pp. 32.

188. **Stocker.** An unusual case of thrombosis of the anterior basal sinuses following orbital thrombophlebitis. *Arch. f. Augenheilk.*, xliv., Ergängungsheft.

189. **Hertel.** On three cases of severe bilateral pneumococcus infection of the eyes after measles. *Graefe's Archiv*, liii., p. 503.

190. **Nikolsky.** A case of panophthalmitis of malarial origin. *Wjest. ophth.*, 1902, Jan.–Feb.

191. **Cerano.** Ocular affections in their relation to diseases of the nasal cavities and the sinuses of the face and brain. 2 vols., Naples, *Unione Tipographica.*

192. **Chaillons.** Ocular lesions in the course of polymorphous erythema. *Ann. d'ocul.*, cxxvii., p. 173.

193. **Strzeminski.** Rare ocular complications of the mumps. *Rec. d' opht.*, xxiv., 2, p. 65.

194. **Vaquez.** Pupillary disturbances and lesions of the aorta. *Bull. d. l. soc. méd. d. hôpitaux*, Feb. 7, 1902.

195. **Leprince.** Meningitic ocular affections. *Ann. d'ocul.*, cxxvii., p. 207.

196. **Chevallereau** and **Chaillons.** Conjugal tabes. *Bull. d. l. soc. d'opht. de Paris*, Feb. 4, 1902.

197. **Jackson.** Ocular lesions of small-pox. *Denver Med. Times*, Dec., 1901.

198. **Stricker.** Diseases of the eye due to abnormal conditions of the circulatory system. *Cincinnati Lancet-Clinic*, Dec. 21, 1901.

SIDLER–HUGUENIN (183) has looked over 120,000 case histories of Professor Haab and his own for the purpose of studying the various forms of retinitis in hereditary syphilis. The fundus changes are manifold, but one may agree with the writer, who divides them into four main types:

1. Small yellowish-red spots scattered over the fundus with punctate pigmentation (Haab's *Atlas*, 1st edition, Fig. 31, Antonelli, and others).

2. Larger spots, the dark predominating (Haab's *Atlas*, Fig. 32).

3. Large spots, the light predominating (initial stage).

4. A condition similar to retinitis pigmentosa. Besides these there are mixed forms and atypical cases.

SENN (184) states that if cases of "amblyopia without pathological changes" are carefully examined with the pupils dilated, one often finds slight changes indicating existing or past chorioretinitis due to hereditary syphilis. Senn's descriptions agree with Antonelli's, designated as "stigmates ophtalmoscopiques rudimentaires de la syphilis héréditaire," although in some details the authors differ.

GREEFF (185) presented a hysterical girl of twelve, with no objective changes in the eyes. Examination indicated that the fields were very greatly contracted, yet the manner in which the girl went about proved that they were not. The size of the field remained the same at every distance within 6 *m*, not corresponding to a fixed angle and dilating with the distance. Such a condition has aptly been termed a tubular-shaped field, differing from the funnel-shaped field which grows larger with increasing distance from the eye. Greeff finds the tubular-shaped field a very frequent and characteristic symptom in hysteria.

STOCKER (188) describes first the symptoms and manner of development of thrombosis of the anterior basal brain sinuses, and then presents an interesting clinical history. His patient struck the left eye against the wing of an open French window. There developed phlegmon of the retrobulbar tissues with marked exophthalmus. An opening was made down to the bone and the cavity drained. Two days later the other eye protruded and its mobility became diminished. Fever and apathy. It seemed that the process in the left orbit had produced a phlebitis which had been carried through the basal sinuses to the veins of the other orbit. Diagnosis: Infectious thrombosis of the brain sinuses. The patient recovered, and in this respect the case differed from all others reported in literature.[1]

NIKOLSKY (190) describes in detail two cases he observed of purulent metastasis in the eye and one case of metastatic inflam-

[1] Cases of the kind are reported where traumatic phlebitis produces non-infective thrombosis of the cavernous sinus, and spreads through the circular sinus to the cavernous sinus and the orbital veins of the other side. They are grave, but not necessarily fatal. They are operable. See "Traumatic Orbital Sarcoma with Thrombosis of the Cavernous Sinus," ARCH. OF OPHTH., xxix., p. 463. —H. K.

mation of Tenon's capsule, and gives a tabulated synopsis of the literature and a continuation and completion of that presented in Axenfeld's article (*Graefe's Archiv*, xl., 1).

1. Rupture of varicose veins in the legs of a pregnant woman, thrombophlebitis, septicopyemia, abortion, metastatic ophthalmia, abscess of the kidney, infarcts in the kidney and spleen—death.

2. Osteomyelitis of the left femur and humerus, septicopyemia, phlegmon of the right shoulder, gangrene of the right lung, bronchopneumonia of the left lung, metastatic ophthalmia of the right eye—death.

3. Metastatic inflammation of Tenon's capsule following a furuncle on the back—recovery. HIRSCHMANN.

The first volume of CERANO'S (191) book treats in nine chapters of the anatomical, physiological, and pathological relations between the eye and the nose and pharynx. The reciprocal relations of the eye and nose are discussed particularly.

The second volume treats of the sinuses of the face and base of the skull in their relation to the eye and brain.

KRAHNSTÖVER.

CHAILLONS (192) describes the ocular affections accompanying erythema multiforme. Besides the nodules and papules of the conjunctiva described by Terson and Beaudonnet, he discussed the appearance of solitary vesicles of the bulbar conjunctiva which come on simultaneously with vesicles on other mucous membranes. BERGER.

STRZEMINSKI (193) describes two cases of unusual ocular affections accompanying mumps. In one case there was an abscess in the tarsal conjunctiva, in the stage of incubation; in the second case, three weeks after the beginning of the disease, there developed retrobulbar neuritis in the left eye with central scotoma and, months later, slight pallor of the disc and $V = \frac{8}{10}$. The treatment consisted in subcutaneous injections of pilocarpine and, later, salicylate of soda, iodide of soda, and strychnine. BERGER.

VAQUEZ (194) believes that the existence of the Argyll-Robertson pupil with preserved tendon reflexes in cases of aortic insufficiency proves that the latter is of syphilitic nature. He suggests that this complexus of symptoms first described by Babinski be called "syndrome de Babinski." BERGER.

A man with syphilis observed by CHEVALLEREAU and CHAILLONS (196) infected his wife. Years later both showed the initial

symptoms of tabes, the man having pupillary symptoms and the woman marked ataxia. In a second married couple there was post-syphilitic tabes, but the symptoms in the woman (ophthalmoplegia interna, mild chorio-retinitis) were not sufficient to justify the diagnosis, which was made however when the man was found to have unequal pupils and diminished tendon reflexes.

In the discussion Terson called attention to the diagnostic importance of changes in the form of the pupil with reflex iridoplegia which are characteristic of tabes. The pupil is irregularly distorted or oval with its long diameter often oblique. (This pupillary change is known in France as Berger's symptom.)

BERGER.

## SYSTEMATIC REPORT ON THE PROGRESS OF OPHTHALMOLOGY DURING THE SECOND AND THIRD QUARTERS OF THE YEAR 1902.

Sections I.–III. Reviewed by PROFESSOR HORSTMANN, Berlin.

### I.—GENERAL OPHTHALMOLOGICAL LITERATURE.

199. **Fuchs.** *Text-book of Ophthalmology.* Ninth edition, Leipsic and Vienna, 1903, F. Deuticke.

200. **Schwarz.** *Encyclopedia of Ophthalmology.* Leipsic, 1902, Vogel. Parts I. and II.

201. **Bernheimer.** Etiology and pathological anatomy of paralyses of the ocular muscles. *Graefe-Saemisch*, 2d edition, Leipsic, 1902, Engelmann.

202. **Widmark.** *Reports from the Eye Clinic of the Medico-Chirurgical Institute at Stockholm.* Vol. iv., Jena, 1902, G. Fischer.

203. **Hegg.** *Stereoscopic Pictures for Patients with Strabismus.* Second improved edition, Berne, 1901, Schmid and Franke.

204. **Elschnig.** Ophthalmology in Neisser's *Stereoscopic Medical Atlas.* Leipsic, 1902, J. A. Barth.

205. **Heine.** Contributions to the comparative and embryological topography of the brain in Neisser's *Stereoscopic Medical Atlas. Ibid.*

206. **Müller.** Contributions to operative ophthalmology. *Klin. Monatsbl. f. Augenheilk.*, xl., 1, pp. 358 and 505.

207. **Schmidt.** On the frequency of infectious external eye diseases in the industrial region of Westphalia. *Arch. f. Augenheilk.*, xlv., p. 79.

208. **Van Fleet.** The laws of the State of New York relating to contagious diseases of the eye and the results of their enactment and the desirability of further legislation. *Pediatrics*, Aug. 1, 1902.

209. **Hubbell.** Jaques Daviel and the beginnings of the modern operation of cataract extraction. *Journ. Amer. Med. Assoc.*, July 26, 1902.

210. **Friedenwald.** The history of the invention and of the development of the ophthalmoscope. *Ibid.*, March 2, 1902.

211. **Wood.** Hermann von Helmholtz, the inventor of the ophthalmoscope. *Ibid.*

212. **Cohn.** The eyes of the medical students at Breslau. *Arch. f. Augenheilk.*, xlvi., p. 29.

213. **Katz.** The influence of artificial lighting on comfort and the ability to work. *Wratsch*, 1902, No. 37.

214. **Cohn.** The determination of the amount of daylight in the lecture rooms of the Breslau University. *Wochenschr. f. Hyg. u. Ther. d. Auges.* No. 40, 1902.

215. **Issupoff.** Report on the eye department of the Cossack hospital for 1901. *Wjest. ophth.*, No. 3, 1902.

216. **Loktjeff.** A brief report of the eye operations performed in the year 1901. *Ibid.*

FUCHS'S (199) excellent text-book appears in a new improved edition, the ninth since 1889. It presents many changes necessitated by the advances in science. The subject of the toxic amblyopias particularly is treated in an entirely new way. Many other chapters are enlarged and improved.

SCHWARZ'S (200) *Encyclopedia of Ophthalmology* is intended to be a reference book arranged in lexicon form. The general practitioner will find here all that he wishes and the ophthalmologist will find the views held at present in regard to the various points in ophthalmology. The parts already published contain articles from "A" to "Bacteriology of the Eye."

BERNHEIMER'S (201) treatise on the etiology and pathological anatomy of the paralyses of the ocular muscles is the best and most complete yet written upon this subject and is of interest both to ophthalmologists and neuropathologists.

The reports from the Stockholm eye clinic under the direction of WIDMARK (202) contain the following papers: A case of intracapsular absorption of senile cataract by C. Lendahl; clinical and bacteriological observations on the influenza conjunctivitis of nurslings by J. Jundell; on operations for symblepharon by May's method by J. Landström; two cases of concrement in the superior lachrymal canaliculus by A. Dalén; the etiology of myopia by J. Widmark; the siderophon, an apparatus for determining the presence of particles of iron in the body and particularly in the eye by M. Jaunson; a case of blepharochalasis by A. Dalén; and on the importance of venereal diseases as a cause of blindness by J. Widmark.

The ninth part of the *Stereoscopic Medical Atlas*, prepared by ELSCHNIG (204) contains twelve plates of excellent photographs of the external diseases of the eye, which are of great value for teaching purposes.

HEINE'S (205) ten plates represent the location of the brain within the skull in a way true to nature. Heads of the fœtus at different ages, of children, adults, and various animals, are represented. The pictures consist of successive stereoscopic photographs of one half of the head and of the corresponding half of the brain on a single plate. In the stereoscopic picture the external portion of the head appears as if made of glass and the brain is seen beneath it.

According to SCHMIDT (207), among 6000 eye patients there were 1560 cases of primary conjunctivitis. In about half of these, 784, it was of the usual non-infectious form; 248 patients had trachoma; and the 528 others had various forms of infectious conjunctivitis. In only 295 were found micro-organisms which cause infectious inflammation: the Morax-Axenfeld diplobacillus, the pneumococcus, the gonococcus, the diphtheria bacillus, and the Koch-Weeks bacillus.

Thirty-six years ago COHN (212) published the results of the examination of the eyes of Breslau students. Among 410 students he found 244 myopes, or 60%. In 1880 59% of 108 medical students were myopic. In his latest investigation he found myopia in 60%.

KATZ (213) examined many persons who worked comfortably by daylight but in artificial light at once became sleepy. The sleepiness came on soonest when the room was dark and the lamp illuminated the work-table only. When the room was illuminated with lights on the wall, work could be continued longer and the ability to work increased with the general illumination. The author believes that the depressing effect of the artificial illumination depends rather upon its insufficiency in comparison with daylight than in the lack of particular rays found only in sunlight.

HIRSCHMANN.

COHN (214) tested with the Wingen photometer the daylight illumination of the lecture rooms of the Breslau University. He believes that a room is well lighted when the illumination is more than 50 metre candles, moderately lighted when it is between 50 and 10, and poorly lighted when it is less than 10. Most of the

auditoriums were only moderately well lighted, some were poorly lighted, and but few were well lighted.

ISSUPOFF (215) treated 599 hospital and 7419 out-patients, 14.5 % being trachoma patients. He performed 662 operations, 196 being cataract extractions, with 3.5 % of loss. HIRSCHMANN.

## II.—GENERAL PATHOLOGY, DIAGNOSIS, AND THERAPEUTICS.

217. **Axenfeld.** The prophylaxis of septic infection of the eyes. *Muench. med. Wochenschr.*, 1902, p. 1067.

218. **Hirota.** Bacteriological investigations on panophthalmitis. *Zeitschr. f. Augenheilk.*, vii., p. 457.

219. **Galezowski.** Ocular syphilis. *Bull. de la soc. de dermatologie et syphilographie de Paris*, May 1, 1902. (He recommends large doses of mercury and locally adrenalin.)

220. **de Vries.** Ocular carcinoma. *Med. Tydschr. v. Geneesk.*, 1902, 1, No. 16.

221. **de Bono** and **Frisco.** On the permeability of the conjunctival and nasal mucosa to micro-organisms in respect of intraocular affections. *Arch. di Ottalm.*, viii., 11, 12.

222. **Monesi.** Experimental researches on the pathology of the corneal endothelium. *Ibid.*, xxxi., 1, 2.

223. **Gatti.** Researches on the immunization of the eye against pneumococcus infection. *Ibid.*

224. **Tornabene.** The influence of the bile on functional changes in the retina. *Arch. di Ottalm.*, ix., 1, 2.

225. **Bouveyron.** Hemiatrophy of the face in its relations to lesions of the superior cervical ganglion. *L'echo méd. de Lyon*, 1902, Nos. 2 and 3.

226. **François-Franck.** On the phenomena consecutive to the resection of the cervical sympathetic. *Bull. de l'acad. de méd. de Paris*, July 1, 1902.

227. **Terrien** and **Camus.** The influence of excitation of the cervical sympathetic on the refraction of the eye. *Arch. d'opht.*, xxii., 6, p. 386.

228. **Holth.** Kinescopy. A new method of determination of the ocular refraction. *Ann. d'ocul.*, cxxviii., p. 241.

229. **Javal.** The perception of radium by the blind. *Bull. de l'acad. de méd. de Paris*, April 15, 1902.

230. **Mohr.** On iodoform poisoning, with special reference to the ocular disturbances. *Arch. f. Augenheilk.*, xlv., p. 184.

231. **Mayweg.** On magnet operations. *Klin. Monstabl. f. Augenheilk.*, xl., 2, p. 1.

232. **Gelpke.** On the diagnostic value of large electro-magnets. *Ibid.*, p. 32.

233. **Duane.** I. Simultaneous paretic mydriasis, subluxation of the lens, rupture of the choroid, with marked involvement of the retina. II. A peculiar form of persistent pupillary membrane. *Ophth. Record*, March, 1902.

234. **Benson.** A note on the value of the fluorescine test. *Ophth. Review*, May, 1902.

AXENFELD (217) recommends that anomalies of the lachrymal apparatus be looked after before any operations on the eyeball. He makes a uniform practice of syringing through the lachrymal passages with physiological salt solution. If there is incomplete stenosis, frequent cleansing is all that is necessary, but if there is complete stenosis or actual dacryo-cystitis, extirpation of the lachrymal sac is the best prophylactic against infection at the operation. Since a great number of the eyes injured by the so-called occupation injuries are lost by sepsis, it is advisable to remove early every diseased lachrymal sac in persons of the working class who are most subject to these injuries.

In three cases of panophthalmitis, HIROTA (218) found the pneumococcus in pure or nearly pure culture as the cause of the affection.

DE VRIES (220) describes the examination of an eye on which exenteration had been done for carcinoma. Carcinoma of the ball is rather rare. Lagrange cites a great number of cases of epithelioma of the conjunctiva or cornea, but cases in which the tumor enters the eye and destroys it are very rare. De Vries, therefore, believes that epithelial tumors of the eyes appear in two forms: as true infiltrating and perforating, metastases-forming carcinomas, and as tumors which spread along the surface and readily recur after removal, but after removal of the base—*i. e.*, after enucleation—do not return nor give rise to metastases.

JITTA.

DE BONO and FRISCO (221) undertook a series of experiments in order to find out whether the mucosa of the nose and eye was permeable for various micro-organisms. To prevent diffusion along the nasal duct, the duct was cauterized and allowed to close by cicatrization in the animals used. Cultures suspended in sterilized water were then instilled into the conjunctival sac. Two hours later the conjunctival sac was washed out with sterilized water and with a canula the aqueous was withdrawn, and, after a second introduction, the vitreous.

The points of entry were previously cauterized. Cultures from the liquids obtained always gave positive results, and many colonies developed of the bac. pyocyaneus, prodigiosus, staph. aureus, bacillus of authrax and of tuberculosis, when the infecting solutions were left in the eye half an hour or an hour, except in the case of the authrax bacillus, which required two hours.

Death never occurred, even when the anthrax bacillus was used. (Considerable scepticism as to these results is permissible.—TRANS.) KRAHNSTÖVER.

MONESI (222) warns against the use of disinfecting solutions directly in the anterior chamber, since, according to his observation, the corneal endothelium may readily be detached as a result of previous inflammation and by the exit of the lens. He recommends salt solution only, which does not affect the endothelium. KRAHNSTÖVER.

GATTI (223) has made numerous experiments in order to ascertain whether the immunization of a rabbit with serum obtained by repeated inoculations of a sheep with cultures of the pneumococcus would protect the eye against local inoculations with the pneumococcus. The experiments were entirely negative, both when the serum was used for the entire body and also when it was injected into the anterior chamber. In control experiments the serum proved efficacious against general infection when 2–3 *cg* per *kilo* of weight were used. The aqueous humor in animals immunized in a general way had no influence on pure cultures of the pneumococcus. KRAHNSTÖVER.

TORNABENE (224) injected bile into frogs under different conditions of illumination before and after. In some cases the chemical reaction of the retina was changed, the formation of visual purple was diminished, and changes in the location of the retinal pigment occurred. This disturbance of the retinal pigment the author believes to be the chief cause of the visual disturbances, particularly hemeralopia in persons with affections of the liver. KRAHNSTÖVER.

BOUVEYRON (225) in two cases of disease of the apex of the lung observed unilateral atrophy of the face on the same side with enophthalmus and slight ptosis. No pupillary changes were found. He calls attention to a report by Jacquet, who found in a case of right-sided atrophy of the face and left-sided ephidrosis and teleangiectasis of the face, a destruction of the right inferior cervical ganglion (due to disease of the lymphatic glands) and pleuritic membranes at the apex; on the left side Jacquet found a fresh affection of the cervical ganglion, with similar changes in the glands and pleura. BERGER.

FRANÇOIS-FRANCK (226) distinguishes the symptoms following resection of the cervical sympathetic into permanent and transi-

tory. To the former belong myosis, ptosis, congestion of the conjunctiva, the gums, brain, etc.; to the latter, hypotony, diminution of perspiration, and difficulty in chewing and swallowing. Trophic disturbances or anomalies of physical or psychic development are not observed in the persons operated upon.

TERRIEN and CAMUS (227) found after section and excitation of the cervical sympathetic in the rabbit, cat, dog, and monkey an increased refraction as determined with the ophthalmoscope of 1–25 D. This increase began shortly before the dilatation of the pupil and passed off before the pupil had regained its normal width. The cause is as yet unexplained. There does not seem to be a lengthening of the ball from the action of the muscles. Whether the lens is forced forward or its curvature increased could not be made out with certainty. v. MITTELSTÄDT.

Under the name kinescopy HOLTH (228) describes a new subjective method of determining refraction, based on the following principle: When an emmetropic eye views an object, such as a white disc 10 *cm* in diameter, at a distance of 6 *m*, through a stenopaic slit which is moved from side to side, an apparent movement of the object viewed is seen, the movement of the object being in the same direction as that of the slit when the eye is myopic, and in the opposite direction when the eye is hyperopic. In emmetropia there is no apparent movement. The cause of this phenomenon is readily explainable from the behavior of the circles of diffusion, as the author shows in illustrations. The procedure may be used for the determination of astigmatism also. The author has devised a particular instrument for the purpose—the kinescope. The method is useful for controlling the tests with type, and in cases of diminished vision, and in simulators. DALÉN.

JAVAL (229), jointly with CURIE, studied the effect of the radium rays upon the blind. In a case of atrophy of the optic-nerve and in one of glaucoma there was no perception of light, while in a case of detachment of the retina and one of blindness from blennorrhœa there was perception of light. Javal concludes from these experiments that blind persons, whose optic-nerve fibres are still intact, are sensitive to the radium rays, and he believes that this method of examination may be used for diagnostic purposes in ophthalmology. BERGER.

MOHR (230) found papillitis, or papillo-retinitis, in two cases of

iodoform poisoning, the optic-nerve affection passing off when the use of iodoform was discontinued.

In the course of ten years MAYWEG (231) has made 92 magnet extractions, 20 being cases in which the iron splinter had passed into the anterior segment of the ball. In all the rest the splinter was in the posterior segment, either in the vitreous, retina, or choroid, or in the orbit after having passed through the posterior wall of the eyeball. In the 72 cases of extraction of the splinter from the interior of the eye, a meridional section of the sclera was made in 47 cases. In 25 cases the splinter was brought into the anterior chamber by the giant magnet and then removed. Of the 47 cases in which the foreign body was removed with the hand- or giant-magnet through the opening of entrance or a meridional section, 21 obtained good vision, 8 poor vision, and 11 became blind, 7 eyes being enucleated or exenterated. Of the 25 extractions with the giant-magnet after a lance incision of the cornea, 6 had good vision, 3 poor vision, 14 became blind, and 2 eyes required enucleation. This would indicate that the meridional section gives the best results.

In a patient whose eye had been penetrated by a splinter of iron seven years before, GELPKE (232) found at the equator a small yellowish prominence pigmented at its apex. The sideroscope did not indicate the presence of iron, but as soon as the Volkmann magnet was brought near the eye the prominence became more marked. After making a meridional section of the sclera the splinter was removed by the magnet and recovery took place.

BENSON (234) finds that but little has been written about fluorescine as a staining agent for anything but ulcers, and he found that under many conditions the cornea will stain green.

1. Sloughy ulcers stain yellow instead of green.

2. In dendritic ulcers a great deal more than the actual ulcer stains.

3. Occasionally what appears to be a healthy cornea will stain in a patchy manner.

4. Epithelium damaged by caustic alkalies or by acids, or by direct heat, will stain, though the surface be not abraded.

5. The eyes of dead animals stain well.

6. Normal corneæ will stain if they have a good deal of cocaine instilled.

Bikler has stated that corneal endothelium will stain after the

use of cocaine in cases of sympathetic ophthalmia, but of this fact Benson has not obtained confirmatory evidence.

He concludes that the stained part will represent (1) an ulcer not yet covered with epithelium, (2) an abrasion, or (3) epithelium in a dead or diseased condition. MARSHALL.

## III.—INSTRUMENTS AND REMEDIES.

235. **Re.** Observations on some new remedies in ocular therapeutics (aspirin, dionin, adrenalin, picric acid). *Arch. di Ottalm.*, ix., 11, 12.

236. **Kirchner.** On adrenalin, the active principle of the suprarenal capsule in a permanent form. *Ophth. Klinik*, 1902, No. 12.

237. **Rehns** and **Terrien.** On the action of tetanus toxin injected into the vitreous. *Bull. de la soc. de biologie de Paris*, April 12, 1902.

238. **de Rocca-Serra.** Clinical and experimental study of the ocular affections produced by contact with podophyllin. *Thèse de Paris*, 1902.

239. **Pedrazzoli.** A lid speculum. *Arch. d' opht.*, xxii., 7, p. 456.

240. **Sulzer.** Notes on verres à la Chamblant. *Ann. d'ocul.*, cxxvii., p. 401.

241. **Jackson.** The value of trikresol as an antiseptic in ophthalmic practice. *Ophth. Review*, June, 1902.

242. **Hansell.** The use of a solution of permanganate of potassium in the treatment of purulent ophthalmia.

RE (235) warmly recommends the four remedies mentioned—aspirin in affections of rheumatic origin and as an anæsthetic, dionin as an analgesic and specific for corneal phlyctenulæ and suggillations, adrenalin as an agent which rapidly produces ischæmia of the conjunctiva and a specific in spring catarrh, and picric acid as a substitute for nitrate of silver and protargol.

KRAHNSTÖVER.

KIRCHNER (236) recommends adrenalin—1:1000—in catarrhal marginal ulcers of the cornea. He obtained good results in glaucoma when myotics also were used.

REHNS and TERRIEN (237) made experimental studies on rabbits in regard to the action of tetanus toxin. General symptoms appeared most quickly after injections into the vitreous, and less quickly when subconjunctival injections were made. The first symptom was always a spasm of the orbicularis.

BERGER.

According to the investigations of ROCCA-SERRA (238), podophyllin causes the following ocular affections in workmen engaged in using it: œdema of the lids, conjunctivitis, epithelial defects and opalescent opacity of the cornea, and iritis. Besides the

visual disturbances there was severe pain and, in consequence of this, insomnia. The affections may be prevented by using protecting glasses.

The speculum suggested by PEDRAZZOLI (239) for opening the lids in cases of extreme blepharospasm has the size and form of Pean's speculum. The branches, which are introduced from the temporal side, are flat, and have a space corresponding to the cornea. When drawn apart they make a rotary movement, so that the lower margin of the branches comes to lie in the retrotarsal fold. v. MITTELSTÄDT.

SULZER (240) discusses the advantages of bicylindrical glasses over spherical. The former were discovered empirically by the watchmaker, Chamblant, yet the writings of Chevalier would seem to show that he was already familiar with them. Bicylindrical lenses crossed at right angles are preferable to spherical lenses in aphakia, since they produce no spherical aberration. Also for the correction of astigmatism, bicylindrical lenses are preferable to sphero-cylindrical, since by the variation of the angle of the cylindrical axes the most different grades of astigmatism can be corrected with an accuracy which is not to be obtained with the cylindrical glasses now in use. BERGER.

JACKSON (241) states that de Schweinitz was one of the first to call attention to the value of this drug as an antiseptic for ophthalmic use, and in a solution of 1 in 1000 it is reliable and unirritating. In this strength it is certainly less irritating than 1 in 10,000 perchloride of mercury, or of formol.

As a basis for solutions of atropine, etc., it is very useful, as it causes hardly any discomfort. He concludes from a general and extended use of trikresol that it is free from the risk of making the eye worse, that it is an antiseptic solution that will keep itself clean, and that it has a distinct germicidal influence when used to wash out the conjunctival sac.

HANSELL (242) uses the permanganate of potash as strong as 1:600 in bad cases of purulent ophthalmia. The eye is irrigated with the solution every twenty minutes. ALLING.

## BOOK NOTICES.

IV. **Die Refraction u. Accommodation des menschlichen Auges u. ihre Anomalien.** By Prof. C. HESS, M.D., Würzburg. With 105 text-figures. Separate edition of Chapter XII., of Part II. of the 2d edition of the *Encyclopedia of Ophthalmology* by Graefe-Sämisch. Leipzig, W. Engelmann, 1902.

This large octavo volume of 523 pages is an exceedingly thorough exposition of this fundamental and most important section of ophthalmology. It follows the historic growth of our scientific and practical knowledge of ophthalmic optics, with a good deal of geometrical and algebraic demonstration, without, however, entering into higher mathematics. It is by no means a heavy treatise, but attractive, instructive, and highly suggestive reading. Anybody that wants to elaborate certain points, or solve undecided questions, will find new subjects of investigation and opportunities to round out his knowledge on fairly well elucidated topics. The volume, which may be had separately, should be in particular demand by American oculists, who will be pleased to find a good many American names in the text as well as in the elaborate bibliography.

H. KNAPP.

V. **Spectacles and Eyeglasses.** By R. J. PHILLIPS, M.D. Third edition, revised, with 52 illustrations. P. Blakiston & Son. Philadelphia, 1902. This little book of 109 pages, price $1, contains a good deal of practical information for the eye surgeon as well as for the optician. The portions relating to bifocal glasses and to prisms have been rewritten.

"The most modern and successful form of bifocal glasses is the so-called 'cemented' bifocals. To the back or front surface of the distance glass is cemented, by means of Canada balsam, a small lens whose strength, added to that of the distance glass,

equals the glass required for near work. The upper edge of the supplemental lens should be ground as thin as possible in order to render it inconspicuous. These spectacles are strong, light, and handsome."

"In still another form of bifocal glass the small supplemental lens is countersunk — that is to say, is cemented into a corresponding concavity ground in the distance glass. Or the distance glass may be composed of two full-sized plano-convex lenses with their plane surfaces in apposition, each of these surfaces being ground out at its lower part, so as to house the small supplemental lens between them. These two forms admit of a reduction of weight and the abolition of chromatic aberration in the heavy glasses required in aphakia. To accomplish the latter purpose the distance lens is made of crown glass and the supplemental lens of flint glass. In this form they are called achromatic bifocals. Their disadvantage lies in the expense of their manufacture."

The combination of spherical, cylindrical, and prismatic glasses is thoroughly analyzed, both in their optical effects, and the best methods of setting them. The decentration of glasses in prismatic combinations is carefully described and provided with tables, chiefly based on the publications of E. Jackson.

H. KNAPP.

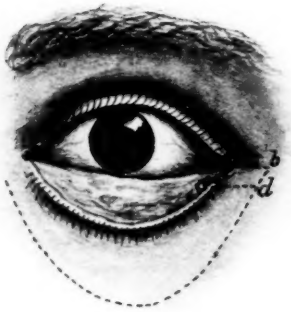


FIG. 1.

FIG. 2.